

PROCESSING OPERATIONS CONTROL OMI PLANNING SHEET



Wad Number S6444-J04-R02	SITE LCC	Elem CD V	End Item 104 FLT: 025	DATE: 04/04/2002 TIME: 16:00:42
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Title: SSV ICE AND DEBRIS ASSESSMENT	Sub Element/Zone 30
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Project Work Order No.	Hazard: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	SFOC Safety <i>NA</i>	WC 032 USA APR 4 '02	<input checked="" type="checkbox"/> Local Copy
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Authorizing Document ORB425	Material & Equipment: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	MICR Req'd <input type="checkbox"/> Yes <input type="checkbox"/> No	OMRS: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
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PERFORM THE FOLLOWING:

Pre-Ops Setups

Task	Operation Number	Seq	Steps	Task	Operation Number	Seq	Steps
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OPS Support

Task	Operation Number	Seq	Steps	Task	Operation Number	Seq	Steps
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CVAS	TIPS	ME	TACGS
USA VM 032	USA VM 033	USA VM 039	USA VM 048

Operating Instructions

Task	Seq	Steps	Task	Seq	Steps
	010			080	
	015			090	
	020			100	
	030			110	
	040			120	
	050			130	
	060			140	
	070			150	

Post Ops

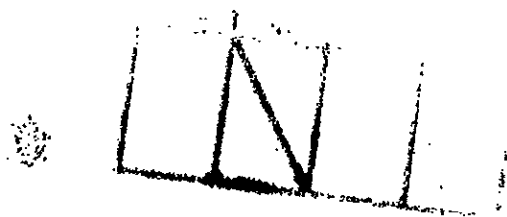
Task	Operation Number	Seq	Steps
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Appendices


Task	Seq
N/A	






Subtask WAD's

N/A



OMI TASK CLOSEOUT CHECKLIST

OMI No. <div style="font-size: 1.2em; font-family: cursive;">56444 J64</div>	Run No. <div style="font-size: 1.2em; font-family: cursive;">2</div>	Task Control No. (TCN) <div style="font-size: 1.2em; font-family: cursive;">2985694</div>
Start Date <div style="font-size: 1.2em; font-family: cursive;">4/8/08</div>	Completion Date <div style="font-size: 1.2em; font-family: cursive;">4/29/08</div>	Closure Date <div style="text-align: right;">  MAY 22 08 </div>

	QC/Eng.	Date
1. Deviation Index: Verify total number of deviations agree with index. Verify entry is correct into OMI.		<div style="font-size: 0.8em; transform: rotate(-90deg);">MAY 22 08</div>
2. Constraints: Verify all constraints are cleared. <div style="font-size: 1.1em; font-family: cursive;">NO DIR Required.</div>	<div style="font-size: 1.2em; font-family: cursive;">NA</div>	<div style="font-size: 1.2em; font-family: cursive;">NA</div>
3. IPR's: Verify that all IPR's are closed or upgraded to problem reports or dispositioned as no constraint to OMI closure and incorporated in central IPR system and a copy of the central IPR sort attached.		<div style="font-size: 0.8em; transform: rotate(-90deg);">MAY 22 08</div>
4. Verify that material and equipment requirement list enclosed (if applicable).	<div style="font-size: 1.2em; font-family: cursive;">NA</div>	<div style="font-size: 1.2em; font-family: cursive;">NA</div>
5. OMI: Verify that all pages or verification sheets are completed, stamped, and dated in the lower left/right hand corners.		<div style="font-size: 0.8em; transform: rotate(-90deg);">MAY 22 08</div>
6. OMI: Verify that all miscellaneous documents/procedures have sequence number referenced and stamped; e.g., photos, sample results, etc.		<div style="font-size: 0.8em; transform: rotate(-90deg);">MAY 22 08</div>
7. Planned task/OMI satisfactorily completed. OPR: <div style="font-size: 1.2em; font-family: cursive;">R. Brewer</div> <div style="font-size: 1.2em; font-family: cursive;">11-29-02 Run # 2</div>		<div style="font-size: 0.8em; transform: rotate(-90deg);">MAY 22 08</div>

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SSV ICE AND DEBRIS ASSESSMENT

Element/End Item: ALL
Flow/Usage: ET-103 & SUBS
Facility: LC 39
Design Center Concurrence: MSFC,JSC
Category: B
OPR: ETM
TTL ORG: SE

**This document contains
HAZARDOUS operations.**

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1.0 INFORMATION

1.1 Objective

Provide necessary tasks that document, monitor and evaluate ice and debris conditions to eliminate or minimize debris concerns of the integrated SSV during ET tanking, FRF, launch, and associated detanking.

Description

1. This OMI is performed as subtask to S0007/S0014/S0037.
2. This OMI provides documentation of ice/debris activities:
 - A. Pre-launch icing briefing
 - B. Pre-launch debris inspection
 - C. Countdown - Based timeline evaluation monitoring of ET TPS surfaces using OTV
 - D. OTV monitoring of seal/flange areas for cryogenic leakage
 - E. SSV OTV monitoring for debris conditions during countdown
 - F. Cryogenic replenish inspection for evaluation of SSV and facility debris concerns or anomalies
 - G. Evaluation of concerns/anomalies in the event of ET detanking
 - H. Review of engineering film data for SSME ignition, launch, ascent, ET separation, and orbiter landing.
3. Orbiter landing debris information is contained in the NASA publication for Ice and Debris Assessment. That report is referenced in this OMI for continuity of debris data.

1.2 Special Instructions All Operations

1. This OMI is run as a subtask to OMI's S0007, S0014, and S0037. All PAD clearing and controlled access operations will be performed per those OMI's.
2. Constraints will be statused by controlling OMI's S0007/S0014/S0037.
3. The OTV camera numbering scheme for PAD A/B is 0XX/1XX.
4. Task Team Leader assignment: NASA PH-H is TTL for L-20 Hour Walkdown, Final Inspection, and Post Launch/Drain Walkdown. ETM is TTL for all other operations.
5. From time stable replenish mode starts until start of final SCAN, scanning with individual cameras should be performed approximately once per hour.
6. Cameras 061/161, 063/163, and 070/170 may be released to NASA select with CICE concurrence.
7. All personnel participating in final inspection and post drain walkdown shall be current in following training:
 - A. Emergency PAD egress
 - B. Fire fighting
 - C. ELSA
8. Milestones:
 - A. MLP portion of post launch walkdown commences at approximately T + 1 hours.
 - B. PAD acreage portion of the post launch walkdown commences at approximately T + 2 hours. (may be deferred until preferred daylight hours.)
 - C. Post drain walkdown commences at approximately T + 4 hours after drain initiated (typically 1 1/2 hours after LH₂/LO₂ low level sensors dry).
9. Hands-on investigation required for all ET-TPS defects suspected of violating NSTS 08303 ice/debris inspection criteria.
10. From time launch scrub is declared until 1.5 hours past time LH₂/LO₂ low level sensors read dry, OTV camera scanning shall be performed approximately once per hour.

11. OTV cameras 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171 shall be used to monitor LO₂/LH₂ tank drain operations.
12. Excessive vapors are defined as being more severe than that described in NSTS 08303 - Ice/Debris Inspection Criteria or NSTS 16007 - Launch Commit Criteria - Hazardous Gas Subsystem.
13. Quality coverage is not required for performance of this OMI. Ref SFOC-GO0007, Ice and Debris Team Operations are exempt from quality coverage. The ROR (CTIF) performs the CMQC function for all non-hazardous operations.
14. Personnel using Sony DKC-ID1 camera shall verify lithium ion battery is securely locked in the bayonet fitting and the lithium button battery door is securely locked and taped in place.
15. Verify camera flash is deactivated.
16. Personnel using Kodak DC 50/120 camera shall verify alkaline batteries are properly installed.
17. Personnel using digital cameras shall not operate in H₂ leak or O₂ rich environment (23 percent or greater).
18. Personnel using the Sony MVC-FD91 camera shall verify the lithium ion battery is securely locked and the battery door is locked closed. Personnel shall verify that both battery doors (lithium ion and lithium button) are closed and taped shut.
19. Personnel shall verify that cameras and equipment are securely tethered when at the PAD while the SSV is present.

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1.3 Operations List

Operation		Shop/ Cntl Rm Console	OPR	Haz (Y/N)	Duration (Hrs)
No.	Title				
10	Support Preparations	STM/ FR2	ETM	N	0.2
15	IR Camera Setup	PH-H/ NA	ETM	N	4.0
20	Ice Prediction Briefing	SE/ NA	ETM	N	0.5
30	Pre-launch Walkdown	SE/ NA	ETM	N	2.0
40	Ice Frost Debris Console Initial Configuration Setup	SE/ FR2	ETM	N	3.0
50	SSV Debris Assessment	SE/ FR2	ETM	N	18.0
60	Group 1 Monitoring LO2 Chill Down Thru T-0	SE/ FR2	ETM	N	15.0
70	Group 2 Monitoring - LH2 Chill Down Thru T-0	SE/ FR2	ETM	N	15.0
80	Final Inspection	SE/ FR2	ETM	Y	3.0
90	LO2/LH2 Drain Monitoring	SE/ FR2	ETM	N	4.0
100	Console Securing	SE/ FR2	ETM	N	0.5
110	Summary Tape	SE/ FR2	ETM	N	18.0
120	Post Drain Walkdown	SE/ NA	ETM	Y	2.0
130	Post Launch Walkdown	SE/ NA	ETM	Y	3.0
140	Film Review	SE/ NA	ETM	N	15.0
145	IR Camera Removal	PH-H/ NA	ETM	N	2.0
150	Final Report	SE/ NA	ETM	N	0.5

2.0 SAFETY INFORMATION

2.1 Hazards

Operation

1. Working at unprotected heights.
2. Walkdown at PAD while SSV is in stable replenish mode.

2.2 Safety Requirements

Operation

1. If lightning activity is forecast to be within 5 miles of launch PAD, CTC and SFOC safety shall implement provisions of adverse/severe weather and lightning policy contained in GSOP 5400 Ground Safety Operations Procedures.
2. There are no safing/shutdown or evacuation steps required in this OMI.
3. Hazardous operations within this subtask OMI will not be started until safety concurrence to proceed has been given per the integrated OMI controlling this subtask.

2.4 Reference Safety Documentation

Number	Rev	Title
KHB 1710.2	LI	KSC Safety Practices Handbook
GSOP 5400	LI	Ground Safety Operating Procedures

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3.0 STAGING REQUIREMENTS

3.1 Referenced Engineering Documentation

3.1.2 Documents (Auto Build Section)

3.1 Referenced Engineering Documentation

3.1.2 Documents

OPERATION 120

Document No.	Rev	Title
NSTS 08303	(LI)	NSTS PROGRAM ICE/DEBRIS INSPECTION CRITERIA

3.2 Parts, Materials, Equipment, and Special Tools

3.2.5 Shop Support Materials

OPERATION 15

Part No./Find No.	Nomenclature	Qty	Unit
8305-00-519-3144	Rymple cloth	2	roll
6810-00-543-7915	Isopropyl alcohol	8	ounces

OPERATION 145

Part No./Find No.	Nomenclature	Qty	Unit
8305-00-519-3144	Rymple cloth	2	roll
6810-00-543-7915	Isopropyl alcohol	8	ounces
6505-00-133-8025	Petroleum Jelly, Vaseline (or equivalent)	1	tube/jar

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3.2.8 Personal Protective Equipment

OPERATION 15	Nomenclature N-Dex nitril gloves chemical splash goggles face shield
OPERATION 30	Nomenclature safety harness lanyard
OPERATION 80	Nomenclature safety harness lanyard Nomex coveralls with gloves and hoods ELSA
OPERATION 120	Nomenclature safety harness lanyard hardhats flame retardant coveralls
OPERATION 130	Nomenclature safety harness lanyard hardhats flame retardant coveralls
OPERATION 145	Nomenclature N-Dex nitril gloves chemical splash goggles face shield

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4.0 PLANNING REQUIREMENTS

OIR Required Yes [], No [X]

4.3 LPS Requirements

4.3.1 Computer Systems

PC GOAL
CCMS Configuration
CDS
CMS

4.4 Support Services, Commodities, and Equipment

4.4.2 Communications

(Per controlling OMI S0007, S0014 or S0037 unless specified otherwise)

4.4.3 OTV

(Per controlling OMI S0007, S0014 or S0037 unless specified otherwise)

OTV Cameras required: 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171

OTV Cameras to be recorded: 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171

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4.4.4 Countdown Display/Status

<u>Display Required</u>	<u>Bldg</u>	<u>Room</u>	<u>Operation Time</u>
Timing	LCC	FR2	Duration of Test
Countdown and GMT	LCC	FR2	Duration of Test

4.4.8 Services

SGS Organization
LS

Operation/Step
10-2

COMM Organization

Operation/Step

COMM	10-1
COMM	50-6
COMM	60-1
COMM	60-3
COMM	60-6
COMM	60-9
COMM	60-11
COMM	70-1
COMM	70-3
COMM	70-6
COMM	70-9
COMM	70-10
COMM	70-11
COMM	90-2
COMM	90-4
COMM	100-2

4.4.12 Propellants, Gases and Chemicals

<u>Commodity</u>	<u>Spec No.</u>	<u>Quantity</u>	<u>Rcvr</u>	<u>Location</u>	<u>Minimum Press</u>	<u>Delivery Time</u>
GN ₂	SES-0073 -6.3-5	Min 750 Cu ft	PH-H 861-3645	Pad 39B Camera Site 2	3000 PSI	1 week prior to T-0

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5.0 CONFIGURATION ACCOUNTING AND VERIFICATION

5.1 Specific OMRS Requirements Satisfied by this TOP

OMRS NO.	NOMENCLATURE/ EFFECTIVITY	SEQ-STEP (CAP)
S00E00.021	ET TPS MON DURING DETANK	90-005
L01	TAF;C	
S00E00.031	POST DETANK ET TPS INSPECT	120-002
L01	TAF;C	
S00FAC.900	PRELAUNCH WEATHER BRIEFING (L-1 DAY)	20-001
L01	VAF1-90	
S00FB0.005 (1)	ET TPS SURFACE MONITORING	50-024
L01	T23,27-29,31-999	
S00FB0.350 (1)	MONITOR GO2 VENT HOOD	50-026
L01	VAF1-90	
S00FB0.360 (1)	MONITOR ET/ORB MPS FOR LEAKAGE	50-024
L01	VAF1-90	
S00L00.150	HIGH WIND ET NOSE INSPECTION	50-022
L01	SAF;C	
S00U00.010 (1)	POST LAUNCH SHUTTLE/PAD AREA INSPECTION	130-002
L01	SAF1-999	
S00U00.011 (1)	ENGR REVIEW & ANALYSIS OF LAUNCH FILM	140-001
L01	SAF1-999	
S00J00.020-A (1)	ENGINEERING PAD INSPECTION	80-002
L01	SAF1-999	
S00U00.020-C (1)	INSPECT ORBITER AFT ENGINE	80-002
L01	SAF1-999	
S00U00.020-D (1)	INFRARED SURVEILLANCE	80-002
L01	SAF1-999	
S00J00.030 (1)	PRELAUNCH SHUTTLE/PAD AREA INSPECTION	30-001
L01	SAF1-999	

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5.5 List of References

OPERATION 20

Reference No.	Rev	Title
NSTS 16007	(LI)	NSTS Program Launch Commit Criteria - Hazardous Gas Subsystem and Appendix F

OPERATION 30

Reference No.	Rev	Title
80901019010	(LI)	ET Post Build Acceptance and In-Process Rework Requirements Manual - Offsite

OPERATION 40

Reference No.	Rev	Title
79K24576	(LI)	OTV System Installation, LC 39, Pad A
79K24522	(LI)	OTV System Installation, LC 39, Pad B

OPERATION 50

Reference No.	Rev	Title
SPI SP-519	(LI)	OMI and OM Implementation
SFOC GO0007	(LI)	Quality Planning Requirements Document (QPRD)

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OPERATION 10 Support Preparations

Shop: STM
Cntrl Rm Console: FR2
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 0.2

10-1 STM JYVO 138

Verify PAD OTV system is configured to support S6444 as scheduled.

Support: COMM

10-2 STM JSTC 111
JSTC *SCB 114

Verify eight 10-minute ELSA's available at complex J for use by Final Inspection Team (ref S0007/S0014/S0037).

Support: LS

10-3 STM TBC 136

Operation - Support Preparations complete.

*** End of Operation 10 ***

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OPERATION 15 IR Camera Setup

Shop: PH-H
Cntrl Rm Console: NA
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 4.0

WARNING

Hard hats required on the Pad when SSV is not present.

CAUTION

Exercise care to avoid dropping equipment, fasteners, etc from RSS Roof to prevent damage to equipment or injury to personnel. All tools must be tethered.

NOTE

IR Camera installation at RSS Roof site may be not performed if IR Camera already installed or if technical concerns preclude such.

15-1 Install IR camera at RSS Roof Site as follows.

1. **Rotate** camera housing back cover to open position by removing bolts with flat washers (20 pl). **Retain** bolts/washers for reinstallation.
2. **Remove** camera housing front cover by removing fasteners (2 pl). **Reinstall** fasteners after cover removal. **Retain** cover for reinstallation after IR Camera Unit removal.
3. **Install** IR Camera Unit into camera housing. **Secure** IR Camera Unit in housing by locking spring pin at lower, left.

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WARNING

Power cable is live. Care should be exercised when connecting power cable to avoid electric shock.

CAUTION

Do NOT allow opened back cover to exert undue force on cables once cables have been connected.

4. **Connect:**
 - OTV coaxial cable
 - Pan & tilt cable
 - Controller cable
 - Power cable
5. **Rotate camera housing back cover into closed position. Secure back cover by installing bolts/flat washers (20 pl). Tighten bolts wrench tight.**



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WARNING

Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system. Ensure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear **N-Dex nitril gloves** and **chemical splash goggles**. When working at eye level or above wear a **face shield** over goggles.

WS002.a 05-22-01

6. **Clean** IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rympel cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl alcohol .
7. **Perform** functional checkout of IR Camera Unit using local controller if required at Task Team Leader (TTL) discretion.

Sub Step Not Performed:

ET/05

4-8-02

NASA PH-H _____ N/A Date _____

USA ETM _____ N/A Date _____

Not Performed:

ET/05

4-8-02

NOTE

IR Camera installation at Camera Site 2 may be not performed if IR Camera already installed or if technical concerns preclude such.

15-2 Install IR camera at Camera Site 2 as follows.

1. **Rotate** camera housing back cover to open position by removing eight ea bolts using Phillips screwdriver. **Retain** bolts/washers for reinstallation.
2. **Remove** camera housing front cover by removing securing bolt(s). **Reinstall** bolt(s) after cover removal. **Retain** cover for reinstallation after IR Camera Unit removal.
3. **Install** IR Camera Unit into camera housing. **Secure** IR Camera Unit in housing by tightening set screw(s) wrench tight at lower left/right.

WARNING

Power cable is live. Care should be exercised when connecting power cable to avoid electric shock.

4. **Connect:**
 - OTV coaxial cable
 - Pan & tilt cable
 - Controller cable (2 pl)
 - Power cable
5. **Rotate** camera housing back cover into closed position. **Secure** back cover by installing bolts (8 pl). **Tighten** bolts using Phillips screwdriver.

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WARNING

Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system. Ensure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear N-Dex nitril gloves and chemical splash goggles. When working at eye level or above wear a face shield over goggles.

WS002.a 05-22-01

6. Clean IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rymple cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl alcohol.
7. Perform functional checkout of IR Camera Unit using local controller if required at Task Team Leader (TTL) discretion.

Sub Step Not Performed:

EW/8
4-8-02

NASA PH-H N/A Date _____

USA ETM N/A Date _____

Not Performed:

EW/8
4-8-02

*** End of Operation 15 ***

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OPERATION 20 Ice Prediction Briefing

Shop: SE
Cntrl Rm Console: NA
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 0.5

NOTE

Ref: NSTS 16007 (LI) NSTS Program Launch Commit Criteria - Hazardous Gas Subsystem and Appendix F defines the ET No-Ice Zone.

20-1 CICE

Conduct L-1 day ice prediction briefing with launch director.

PH-H Signature

A. Olin 4/8/02
A. Olin PH-112

OMRSD S00FA0.900

03/04

20-2 Operation - Ice Prediction Briefing complete.

*** End of Operation 20 ***

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OPERATION 30 Pre-launch Walkdown

Shop: SE
Cntrl Rm Console: NA
OPR: ETM
Zone: PAD
Hazard (Y/N): N
Duration (Hrs): 2.0

WARNING

Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

NOTE

This operation is performed at approximately L-20 hours. When this operation is performed in support of a 24 hour scrub turnaround, the preceding launch scrub post drain walkdown and this pre-launch walkdown may be performed concurrently.

Inspections may also be performed from the RSS, GO₂ Vent Arm (GVA), -Y OWP, or +Y OWP if still extended and accessible.

Ref: 80901019010 (LI) ET Post Build Acceptance and In-Process Rework Requirements Manual - Offsite

NASA ET Mechanical Engineer (PH-H) or designee shall function as team leader. Following personnel are optional walkdown participants.

NASA Engr	(4)
SFOC Engr	(2)
LMSSC - LSS	(1)
Boeing - LSS	(1)
SRB ELE	(1)
Thiokol - LSS	(1)

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30-1 Debris inspection team **perform** walkdown of SSV and MLP per following:

1. Team leader **verify** S6444 pre-test briefing complete.
2. **Assemble** following essential personnel

NASA PH-H Engineering - 1
SFOC ETM Engineering - 1
3. **Inspect** following areas (as a minimum) from the MLP, RSS and FSS to identify/ resolve potential debris sources.

Areas to be inspected

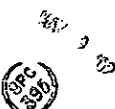
- A. Launch vehicle external surfaces
 - Orbiter
 - SRB's
 - External Tank
- B. MLP surfaces
 - LH and RH SRB holddown posts
 - Deck including deck bolts, fixtures, and edge gutters
 - SSME LH and RH SRB exhaust openings, and sound suppression (SS) troughs
 - TSM's and camera housings
4. Ref Table 30-1, **document** and SIM Photograph SSV and Launch PAD Configuration.

Description: Pre launch walkdown.

OMRSD S00U00.030-1 USA
VM
026

SPC No. 51105

Disc/Frame Nos: 1-30



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- 30-2 Record all facility discrepancies in S0007. Submit copy to PAD leader and notify TBC/CTC. Verify no constraints to continue. Forward description(s) of debris found to SFOC QC for entry into Processing Debris / FOD Database.

PH-H R. F. Speece Date 4-8-02
R. F. Speece
ETM R. Brewer Date 4-8-02
R. Brewer

- 30-3 Operation - Pre-launch Walkdown complete.

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Table 30-1 Photo Requirements for SSV and Launch Pad Configuration

Photos from MLP			
<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
ET -Z	Vertical	28 mm	
Aft Dome	Horizontal	28 mm	
Aft Dome	Horizontal	35-70 mm	
LH SRB from North	Horizontal	35-70 mm	All water troughs in view
LH SRB from North	Vertical	35-70 mm	3-4 water troughs in view
LH SRB from East	Vertical	35-70 mm	
RH SRB from North	Horizontal	35-70 mm	All water troughs in view
RH SRB from North	Vertical	35-70 mm	3-4 water troughs in view
RH SRB from West	Vertical	35-70 mm	
SRB Heater Elec T-0	Horizontal	35-70 mm	Foam intrusion; May need flash
North HDP	Vertical	35-70 mm	Representative view
South HDP	Vertical	35-70 mm	Representative view
TSM T-0 LH ₂	Vertical	35-70 mm	Flash needed
TSM T-0 LO ₂	Vertical	35-70 mm	Flash needed
Orbiter Left & Right Wing	Vertical	35-70 mm	From below ET (1 Photo each wing)

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135 Ft Level Photos

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LO ₂ UMB	Vertical	35-70 mm	From OWP usually during T5401
LH ₂ UMB	Vertical	35-70 mm	From OWP usually during T5401

215 Ft Level Photos

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
ET surfaces from FSS	Vertical	35-70 mm	
LH SRB Frustrum and FWD skirt	Vertical	35-70 mm	
RH SRB Frustrum and FWD skirt	Vertical	35-70 mm	
Jack Pad C/O's	Horizontal	35-70 mm	Flash needed (1 each C/O)
LO ₂ Ogive Cable Tray	Vertical	35-70 mm	From RSS roof

255 Ft Level Photos

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
ET surfaces with GO ₂ vent ducts in view	Vertical	35-70 mm	
GO ₂ vent ducts	Horizontal	250 mm	

*** End of Table 30-2 Photo Requirements for SSV and Launch Pad Configuration

*** End of Operation 30 ***

OPERATION 40 Ice Frost Debris Console Initial Configuration Setup

Shop: SE
Cntrl Rm Console: FR2
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 3.0

NOTE

The next step sets up the photo processing laptop for use in the Firing Room. This is not a constraint to set up of the console or to final inspection team operations. Network or equipment failures on the photo processing machine shall be annotated below.

40-1 Configure computer to perform image processing, analysis, and recording:

1. **Connect following equipment at Ice/Frost console:**
 - power cable to computer
 - "Dazzle" capture card to laptop parallel port
 - "Y" adapter to laptop PS2 port
 - keyboard to keyboard port on "Y" adapter
 - mouse to mouse port on "Y" adapter
 - monitor to laptop
2. **Insert Xircon Network Card into Personal Computer PCMCIA port.**
3. **Connect ethernet (gray) cord to Xircon Network Card.**
4. **Remove terminator from video cable.**
5. **Plug BNC-to-RCA adapter into end of video cable.**
6. **Plug video cable into "Dazzle" DVC "video in".**
7. **Power-up Trouble Console VCR.**

03-15-2002
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8. Log-on to KSC Ground Ops. Click-on Start/Programs/Dazzle.
9. Confirm above equipment as operational and record results.

Results OKay

ETM 15/18
4-8-02

NOTE

The next step verifies the setup of the infrared scanners. This is not a constraint to set up of the ice console. IR scanner condition shall be annotated below.

- 40-2 Verify IR scanner operation condition, annotate below.

RSS: OK

CS 2: OK

NOTE

The next step verifies the operation of console monitors in the Firing Room. This is not a constraint to set up of the console or to final inspection team operations. Equipment condition shall be annotated below.

- 40-3 Verify console condition by powering on monitors and tape recorders.

Monitors: OK

Tape recorders: OK

MAY 9 02
908
2002

03-15-2002
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NOTE

ET OTV pre-mapping/initial position of cameras may be performed in random order.

Ref: 79K24576 (LI) OTV System Installation, LC 39, Pad A and

Ref: 79K24522 (LI) OTV System Installation, LC 39, Pad B define OTV camera locations.

FOV designates field-of view. RSS and -Y OWP must be retracted for completion of pre-mapping.

Pre-mapping steps/substeps in the remainder of this operation need not be performed if supporting a scrub turnaround and if performed during a previous run.

It is preferred to record all pre-mapping scanning on a single tape. However, multiple tapes may be used when lighting/ launch countdown constraints necessitate such.

40-4 CVM1 JTV1 223

Perform OTV pre-mapping of External Tank exterior surfaces using OTV Cameras 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, and 067/167 as follows:

- **Insert** designated pre-map tape into trouble console VCR.
- **Punch-up** camera number on trouble monitor.
- **Start** recording on pre-map tape. **Record** start time (GMT).
- **Scan** from top-to-bottom, left-to-right and right-to-left at approximately full zoom-in.
- **Stop** recording on pre-map tape. **Record** stop time (GMT).
- **Record** data in Table 40-1.
- **Repeat** with each OTV camera listed until each has been used to scan the External Tank.
- **Remove** pre-map tape from trouble console VCR.

ETM _____ N/A Date _____

Not Performed: _____



4-8-02

03-15-2002
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40-5 CVM1 JTV1 223

Position OTV Cameras 004/104, 009/109, 013/113, 033/133, 042/142,
054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164,
065/165, 066/166, 067/167, 070/170, and 071/171 to initial positions as
defined in Table 40-2.

EWG

ETM

Date

4/8/02

Not Performed: N/A



03-15-2002
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APPROVED

Table 40-1 ET Pre-Mapping Data		Tape # _____
OTV Camera	Start Time (GMT)	Stop Time (GMT)
004 / 104		
009 / 109		
013 / 113		
033 / 133		
042 / 142		
054 / 154		
055 / 155		
056 / 156		
060 / 160		
061 / 161		
062 / 162		
063 / 163		
064 / 164		
065 / 165		
066 / 166		
067 / 167		

Notes: _____



Table 40-2 OTV Camera Initial Positions	
OTV Camera	Initial Position
004 / 104	FOV centered on GUCP
009 / 109	FOV on LH ₂ Umbilical including ET/Orbiter interface. Vary close-up and wide angle views with 063/163 and 064/164.
013 / 113	Full zoom in. View SW GO ₂ Vent Louver area.
033 / 133	FOV perpendicular to ET and with LO ₂ -to-Intertank splice at frame top and LH ₂ -to-Intertank splice at frame bottom. Then tilt down until XT2058 is in frame center.
042 / 142	FOV centered on Orbiter Access Arm-to-Orbiter interface.
054 / 154	FOV to encompass approximately 3 feet forward of XT2058 to 2 feet aft of XT2058. Orbiter wing and SRB should be in view at frame left.
055 / 155	Set FOV on north bridge LH ₂ pipeline flange.
056 / 156	FOV with LH ₂ Aft Dome in frame bottom and XT2058 in view at frame top.
060 / 160	Full zoom in. View SW GO ₂ Vent Louver area.
061 / 161	Full zoom-in. Adjust FOV until ET LO ₂ -to-Intertank splice is centered vertically and view is perpendicular to ET. Pan right until edge of the ET comes into view. Note: LO ₂ Tank may pass out-of-view.
062 / 162	Full zoom in. View NW GO ₂ Vent Louver area.
063 / 163	FOV on LH ₂ Umbilical including ET/Orbiter interface. Vary close-up and wide angle views with 009/109 and 064/164.
064 / 164	FOV on LH ₂ Umbilical including ET/Orbiter interface. Vary close-up and wide angle views with 009/109 and 063/163.
065 / 165	Full zoom out. Set FOV on aft part of ET with frame bottom approximately 2 feet below LH ₂ Aft Dome.
066 / 166	FOV perpendicular to ET with LO ₂ -to-Intertank splice at frame top. Then tilt down until Orbiter RH Wing/SRB intersection is in frame lower right.
067 / 167	Set FOV with LH ₂ Aft Dome toward frame bottom and 2 nd black ring of SRB in view.
070 / 170	Select down wind camera of these two as wide angle view of the SSV.
071 / 171	Set up wind camera for close-up view of SSME's.

03-15-2002
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OMI S6444 J04
APPROVED

40-6 Operation - Ice Frost Debris Console Initial Configuration Setup complete.

ETM 15/3 Date 4/8/02

*** End of Operation 40 ***

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

OPERATION 50 SSV Debris Assessment

Shop: SE
Cntrl Rm Console: FR2
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 18.0

NOTE

Steps in this operation are contingent upon progression of launch countdown operations and may not be performed if countdown is terminated.

Entire Operation Not Performed: N/A

NOTE

Until otherwise indicated, all times are referenced to S0007, S0014 or S0037 timelines.

No operations/steps within this subtask OMI may be performed as a stand-alone procedure. This OMI may only be performed as a subtask to S0007/S0014/S0037.

NOTE

Ref: SPI SP-519 (LI) OMI and OM Implementation and Ref: SFOC GO0007 (LI) Quality Planning Requirements Document (QPRD), following step complies with requirements for ROR-as-CMQC function.

50-1

CTIF	TBC
TBC	CMQC 136

Notify TBC that CTIF will perform the CMQC function for STS 110, S6444 run 2. Request TBC notify CMQC that the ROR-as-CMQC option will be exercised for STS 110, S6444 run 2.


03-15-2002
APPROVED

OMI S6444 J04
APPROVED

50-2

CTC	TBC	232
TBC	CTIF	136


Perform OTV and ice/frost monitoring area setups.

ETM  Date 4/8/02

50-3

CTIF	TBC	136
TBC	CTC	
CTC	STM	232


Verify Operation 10- Support Preparations complete.

ETM  Date 4/8/02

50-4

CTIF

Verify Operation 20 - Ice Prediction Briefing and Operation 30- Pre-launch Walkdown complete.

ETM  Date 4/8/02

03-15-2002
APPROVED


OMI S6444 J04
APPROVED

50-5

CTIF	CVM1	222
	CVM1	222

Verify:


- All OTV cameras are on, tapes in recorder, and ready to commence OTV scanning, monitoring, and recording.
- Trouble tape recorder is ready.
- Ice Frost Debris Console Initial Configuration Setup complete.

ETM  Date 4/8/02

50-6

CTIF	CICE	222
	CVM1	
	CVM2	
	CIPC	
CTIF	JYVR	138
CVM1	JTV1	223
CVM2	JTV2	225

All personnel participating in OTV operations report test ready status.

ETM  Date 4/8/02

Support: COMM

03-15-2002
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OMI S6444 J04
APPROVED

50-7

CTIF	TBC	136
TBC	CTC	232

Ice Frost Console Area Setups for OTV scanning complete.
Report readiness.

ETM 4/8/02 Date 4/8/02
Not Performed: N/A

50-8

CTIF CVM1 222

From start of LO₂ chilldown until seal deflation/GO₂ vent hood retraction, **monitor** the +Y/-Y GO₂ vent seal-to-ET interface for seal fretting and continuous GO₂ escape.

OMRS S00FB0.350-1

ETM 4/8/02 Date 4/8/02
Not Performed: N/A

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

NOTE

GO₂ vent seal fretting could induce damage to ET SOFI. Continuous GO₂ venting could result in formation of ice in the no ice zone (ref NSTS 16007). Ultimate decision to lift the vent hood rests with CMEC.

50-9

CTIF TBC 136
 CMEC

If +Y/-Y GO₂ vent seal fretting or continuous GO₂ escape detected from start of LO₂ chilldown until seal deflation, **notify** CMEC for GO₂ vent hood removal.

ETM

ET
SO

Date

4/8/02

Not Performed: N/A

50-10

CTIF CIPC 222

Monitor wind speed and direction from start of LO₂/LH₂ chill down through launch/scrub. CIPC **notify** CTIF if winds measured at 38 knots or greater from North +/-30 degrees as measured at 60 feet.

ETM

ET
SO

Date

4/8/02

Not Performed: N/A

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

NOTE

Excessive vapors are defined as being more severe than those described in NSTS 08303 (LI) NSTS Program Ice/Debris Inspection Criteria or NSTS 16007 (LI) NSTS Program Launch Commit Criteria - Hazardous Gas Subsystem.

50-11

CTIF CVM1 222
CVM2

From start of LO₂/LH₂ loading until Prepressurization
(LO₂ at T-2M55s and LH₂ at T-1M57s):

1. **Monitor** following ET-Orbiter MPS areas for leakage:
 - LO₂ Feedline (portion external to the Intertank)
 - LH₂ Feedline
 - LH₂ Recirculation Line
 - LH₂ Aft Dome Manhole Cover(s)
 - ET-Orbiter LO₂/LH₂ Umbilical Disconnects
 - LH₂ T-0 Umbilical
 - LO₂ T-0 Umbilical

2. **Verify** no visible cryogenic liquid or excessive vapors.

OMRS S00FB0.360-1

ETM Tom Ford Date 4.8.02

Not Performed: NA



03-15-2002
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OMI S6444 J04
APPROVED

50-12

CTIF CVM1 222
CVM2

Monitor and videotape following ET TPS surface areas and GO₂ Vent Area during LO₂/LH₂ loading through Prepressurization (LO₂ at T-2M55s and LH₂ at T-1M57s):

- LH₂ Aft Dome
- LH₂ Barrel
- Intertank (external)
- LO₂ Tank
- GO₂ Vent Area
- Protuberances

OMRS S00FB0.005-1

ETM Tom Ford Date 4-8-02

Not Performed: NA

50-13

CTIF CVM1 222

Perform Operation 60 - Group 1 Monitoring.

ETM Tom Ford Date 4-8-02

Not Performed: NA



03-15-2002
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OMI S6444 J04
APPROVED

50-14

CTIF CVM2 222

Perform Operation 70 - Group 2 Monitoring.

ETM Tom Ford Date 4.8.02

T-FORD

Not Performed: N/A

50-15

CTIF CVM2 222

Once per hour minimum, after start of LO₂/LH₂ (until LO₂/LH₂ low level sensors read dry), scan LO₂ feed line brackets and flange closeouts per Table 50-1.

ETM Tom Ford Date 4.8.02

T-FORD

Not Performed: N/A



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50-16

CTIF CICE 222

As count proceeds, for concerns/ observations identified:

1. **Record** observation/concern on trouble tape per Table 50-1.
2. **Document** observed condition on Table 50-2, Observation Worksheet.

ETM Tom Ford Date 4-8-02

Not Performed: NA

50-17

TBC CTIF 136
CTIF CICE 222

Perform Operation 80 - Final Inspection when called by
S0007/S0014/S0037.

ETM R Brewer Date 4-8-02

Not Performed: NA

03-15-2002
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OMI S6444 J04
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NOTE

Final SSV scan typically commences at L-2 hours.

50-18

CTIF CVM1 222
CVM2

Perform final SSV scan.

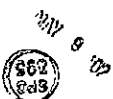
ETM *M. Wolkan* Date 4/8/02
M. Wolkan
Not Performed: N/A

50-19

CTIF CVM1 222
CVM2

At start of T-9 minute hold, **configure** OTV cameras for terminal count.

ETM *S. (Mon)* Date 4/8/02
S. (Mon)
MS
17
Not Performed: NA



03-15-2002
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50-20

CTIF

222

Start continuous recording per Table 50-1 at pick-up of T-9 Minute count including following events:

- T-7M30S OAA retraction on camera OTV 008/108 or 042/142.
- T-3M55S Orbiter elevon movement on OTV 009/109, 054/154, 063/163 064/164.
- T-2M30S GOX Vent Seal retraction, +Y / -Y GOX Vent Louvers, and GOX Vent Seal Footprints on OTV 013/113, 060/160, 061/161, 062/162, 068/168, and 069/169.
- T-1M00S through last view of vehicle during ascent on NASA Select (channel 179).

ETM Tom Ford Date 4.8.02
T. Ford

Not Performed: N/A

03-15-2002
APPROVED

OMI S6444 J04
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NOTE

Ref: NSTS 16007 (LI) NSTS Program Launch Commit Criteria - Hazardous Gas Subsystem Appendix F - Ice Launch Commit Criteria defines "No-Go Conditions."

50-21

CICE CTIF 222

Verify there are no Ice Launch Commit Criteria "No-Go Conditions" being violated.

ETM Mark William Date 4/8/02
MARK WILLIAM

50-22

If winds are from the north (+/-30 degrees) and are 38 knots (peak as measured at 60 feet above ground) or greater:

1. Monitor/videotape nose cone area during high winds.
2. Verify:
 - A. No ice formation on the +Y and -Y GO₂ vent seal footprint areas.
 - B. No damage to the ET TPS at the +Y and -Y GO₂ vent seal footprint areas.
 - C. No damage to the +Y and -Y GO₂ vent seals themselves.
 - D. No evidence of GO₂ leakage from +Y/-Y GO₂ vent seals to ET interface.

USA
VM
028

OMRSD S00L00.150

ETM MA Date 4/8/02

Not Performed: *MAN
4/8/02

*MARK WILLIAM, ET Eng.

50-12



03-15-2002
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50-23

CTIF

Verify launch or launch scrub (drain back). Record data.

Launch ✓ Scrub NA

Date 4/8/02 Time 20:44:17 GMT

Scrub at T- NA

ETM Mark Weller Date 4/8/02
MARK WELLS

50-24

CTIF

ET-Orbiter MPS monitoring for leakage and ET TPS Surface Areas
and GO₂ Vent Area monitoring/recording for launch complete.

OMRSD S00FB0.005-1
OMRSD S00FB0.360-1

USA
VM
026

ETM Mark Weller Date 4/8/02
MARK WELLS

Not Performed: NA

03-15-2002
APPROVED

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NOTE

When completely filled and drain is initiated, it takes approximately 1 hour until the LH₂ tank low level sensors read dry, and approximately 1.5 hours until the LO₂ tank low level sensors read dry.

50-25

CTIF CVM1 222
CVM2

If launch scrubbed (or drain back declared) after start of LO₂/LH₂ slow fill mode:

- Perform Operation 90 - LO₂/LH₂ Drain Monitoring.
- Record observations/concerns on trouble tape per Table 50-1.
- Document all observations/concerns on Table 50-2 Observation Worksheet.

ETM

N/A

Date

MARK WOLCAN

Not Performed:

4/8/02

50-26 CTIF

GO₂ Vent seal to ET interface monitoring for seal fretting and continuous GO₂ escape complete.

OMRSD S00FB0.350-1

USA
VM
026

ETM

MARK WOLCAN

Date

4/8/02

Not Performed:

NA

03-15-2002
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50-27

CTIF CVM1 222
CVM2

Terminate scanning operations.

ETM Mark Nolla Date 4/8/02
MARK NOLLA

50-28

CTIF CVM1 222
CVM2

Perform Operation 100 - Console Securing.

ETM Tom Ford Date 4.8.02

50-29

CTIF

If LO₂/LH₂ tanking started, perform Operation 110 - Summary
Tape.

ETM Tom Ford Date 4.8.02

Not Performed: N/A

03-15-2002
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NOTE

Following step may be not performed at CTIF discretion.

50-30 CTIF TBC 136
 TBC STM

If Post Drain Walkdown to occur at night, **request** PAD xenon lighting be maintained/activated for duration of walkdown.

Not Performed: N/A

NOTE

Post drain walkdown typically commences approximately 1.5 hours after LH₂/LO₂ low level sensors read dry.

50-31

CTIF

If launch scrubbed after start of LO₂/LH₂ tanking, **perform** Operation 120 - Post-Drain Walkdown.

ETM N/A Date

Not Performed:

5/8
4-8-02

50-32

CTIF

If launch occurred, **perform** Operation 130 - Post launch Walkdown.

ETM R Brewer Date 4-8-02

Not Performed: N/A



03-15-2002
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50-33

CTIF

If launch occurred, **perform** Operation 140 - Film Review.

ETM  Date 4-9-02

Not Performed: N/A

50-34

SSV Debris Assessment complete.

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1.	CTIF	CVM1	222	Locate anomaly/concern on pertinent OTV(s)
		CVM2		
2.	CTIF			Punch-up pertinent OTV on trouble monitor. Update trouble tape log in table below.
3.	CTIF			Start the trouble tape.

Trouble tape shall be allowed to run until sufficient OTV documentation of observation/concern has been made. OK to change OTV's while trouble tape is running.

- ## TROUBLE TAPE LOG

TRouble TAPE LOG

OMI-5144- Joy

TRouble TAPE RECORDING LOG

STS-110 S0007

DATE: 04-08-02

LAUNCH

TAPE NO.	CAM. NO.	START TIME (GMT)	STOP TIME (GMT)	DESCRIPTION OF ANOMALY/CONDITION
FF#1	154	11:45	11:47	LO2 FEEDLINE SCAN
	154	12:42	12:45	LO2 FEEDLINE SCAN
	154	13:40	13:43	LO2 FEEDLINE SCAN
	154	14:40	14:42	LO2 F/L SCAN
	155	15:00	15:02	LH2 AFTER DOME MHT COVER TIPS - SMALL FROST SPOT (1/4 INCH DIA)
	109/163	15:20	15:28	SNIPPER REMOVAL
	154	15:45	15:48	LO2 FEEDLINE SCAN
	154	17:06	17:08	LO2 F/L SCAN
	154	17:55	17:58	LO2 F/L SCAN
	154	18:43	18:45	LO2 F/L SCAN
	154	19:26	19:30	LO2 F/L SCAN
	168	19:44	19:46	INSIDE -Y COP SEAL - THREAD 'O LOCKER

Notes:

- ET 114
- ORB 104
- SRB B1112
- MLP 3
- PAD B



TROUBLE TAPE RECORDING LOG

STS-110 S0007

DATE: 04-08-02

LAUNCH

TAPE NO.	CAM. NO.	START TIME (GMT)	STOP TIME (GMT)	DESCRIPTION OF ANOMALY/CONDITION
PT#1	SW5			T-9 RECORDING
	142	T-7M30S	T-5M30S	OAA RETR
	SW5		T-5M0S	T-5M0S HOLD FLOW END PROC.
	SW5	T-5M0S		RESUME
	154			ORB ELEVATION
	160/113	T-3		
	179	T-1M10	20:48:21	LAUNCH VIEW

Notes:

ET 114
ORB 104
SRB BH112
MLP 3
PAD B

PAGE NO. 2 OF 2



OMI S6444 J04
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[illegible]

JUN 07 '02

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. 001

Observed By: Ice Team (FIT)

Date APRIL 8, 2002 Time 12:50 GMT 16:50

Camera No. (or Walkdown) WALKDOWN

Description:

Ice/frost spot at ET/SRM + Y CABLETRAY
Close out Foam. PROBABLY CAUSED BY ADHESIVE
BANDLINE THERMAL SHORT.

Acceptance Rationale (or IPR/PR No.):

VENTING OF COLD VAPOR WITH THIS TYPE OF
DEFECT AND IN THIS AREA IS ACCEPTABLE
PR NSTS 08303 - PAGE 2-30 -

CICE Robert F. Jones PH-HZ Date 4/8/02
CTIF Jim Engle Date 4/8/02

03-15-2002
APPROVED

OMI S6444 J04
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Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____



03-15-2002
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APPROVED

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

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Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

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Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

_____ N A

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

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Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

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Table 50-2 Observation Worksheet

OBSERVATION DOCUMENTATION

Record following information for condition observed:

Observation No. _____

Observed By: _____

Date _____ Time _____ GMT _____

Camera No. (or Walkdown) _____

Description:

NA

Acceptance Rationale (or IPR/PR No.):

CICE _____ Date _____

CTIF _____ Date _____

*** End of Table 50-2 Observation Worksheet ***

*** End of Operation 50 ***



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OPERATION 60 Group 1 Monitoring LO₂ Chill Down Thru T-0

Shop: SE
Cntrl Rm Console: FR2
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 15.0

NOTE

Do not perform this operation if launch scrub declared before LO₂ Chill Down commences.

Operation Not Performed: N/A

NOTE

This operation monitors LO₂ Ogive and Barrel and associated components/ areas from start of Chill Down through T-0 via OTV cameras 013/113, 060/160, 061/161, 062/162, 063/163 and 064/164.

OTV cameras 013/113 and/or 062/162 will view -Y GO₂ Vent Hood Seal at all times. At no time will both cameras be positioned away from the -Y GO₂ Vent Hood Seal.

OTV cameras 068/168 and 069/169 view SW and NE GO₂ Vent Areas respectively. These are fixed FOV cameras and do not have pan, tilt, etc. capability.

Steps in this operation are contingent upon progression of launch countdown operations and may be not performed if countdown is terminated.

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LO₂ Chill Down To L-2 Hour Mark

60-1 CVM1 JYVR 138

At start of vehicle LO₂ Chill Down, **start** recorders for cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169.

ETM

4/8/02

Date

4/8/02

Support: COMM

60-2 Record LO₂ MPS Chill Down start date and time (GMT).

LO₂ MPS Chill Down Date

4/8/02

GMT

Time

11:19

GMT

ETM

4/8/02

Date

4/8/02

60-3 CVM1 JTV1 223

From start of LO₂ Chill Down until start of LO₂ Fast Fill on OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169 **monitor/videotape** ET-TPS surfaces. No cryogenic liquid or excessive vapors allowed.

ETM

4/8/02

Date

4/8/02

Support: COMM

Not Performed: N/K

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03-15-2002
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OMI S6444 J04
APPROVED

60-4 Record LO₂ Slow Fill start date and time (GMT).

LO₂ Slow Fill Date 4/8/02 GMT Time 11:58 GMT 4-8-02

ETM ET/05 Date 4/8/02

Not Performed: N/A

60-5 Record LO₂ Fast Fill start date and time (GMT).

LO₂ Fast Fill Date 4/8/02 GMT Time 12:11 GMT 4-8-02

ETM ET/05 Date 4/8/02

Not Performed: N/A

60-6 CVM1 JTV1 223

From start of LO₂ Fast Fill until LO₂ stable replenish mode is established, monitor/videotape ET-TPS surfaces on OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169. Scan LO₂ Tank. Alternate cameras and scan from Intertank to LO₂ Barrel Splice to GO₂ Vent Hood. No cryogenic liquid or excessive vapors allowed.

ETM ET/05 Date 4/8/02

Support: COMM

Not Performed: N/A

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APPROVED

60-7 Record LO₂ Topping date and time (GMT).

LO₂ Topping Date 8 Apr 02 GMT Time 13:59 GMT

ETM ET/03 Date 4/8/02

Not Performed: N/A

60-8 Record LO₂ Stable Replenish mode start date and time (GMT).

LO₂ Stable Replenish Date 4/8/02 GMT Time 14:16 GMT

ETM ET/03 Date 4/8/02

Not Performed: N/A

60-9 CVM1 JTV1 223

From time LO₂ Stable Replenish mode is established until time for final SSV scan (approximately L-2 hours), **monitor, scan and videotape** ET-TPS surfaces on OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163, 064/164, 068/168, and 069/169. No cryogenic liquid or excessive vapors allowed.

ETM ET/03 Date 4/8/02

Support: COMM

Not Performed: N/A

8:20
248

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OMI S6444 J04
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Final SSV Inspection Scan

NOTE

Final SSV Inspection Scan should begin not later than 1.5 hours prior to start of T-9 minute hold (approximately L-2 hours) to allow ample time to finish. Final SSV Inspection Scan shall include the ET, SRB's and the Orbiter.

Final scan may be altered or partially performed in the event that time constraints will not permit a complete SSV scan prior to start of T-9 minute hold.

During Final SSV Inspection Scan the camera lights on OTV cameras 061/161 and 062/162 shall be turned "Off" when view passes over the Orbiter cockpit to preclude "distracting" the Flight Crew.

60-10 CVM1 JTV1 223

Perform Final SSV Inspection Scan with OTV cameras 004/104, 013/113, 060/160, 061/161, 062/162, 063/163 and 064/164. Scan passes shall view entire SSV with cameras at approximate full zoom in during final scan.

ETM R. Brewer Date: 4/8/02
R. Brewer

Not Performed: N/A

OMI S6444 J04
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NOTE

Cameras may be positioned for SSME ignition in an arbitrary order.

CVM1 camera positions for SSME ignition are defined in Table 60-1.

Ref Table 60-1, **position** cameras 004/104, 013/113, 042/142, 054/154, 060/160, 062/162 for terminal count.

ETM

R. Brewer
R. Brewer

Date _____

Support: COMM

Not Performed: NA

60-12 Operation - Group 1 Monitoring - LO₂ Chill Down Thru T-0 complete.

Table 60-1 CVM1 Camera Positions for Terminal Count

NOTE

This Table defines CVM1 camera positions for terminal countdown. Cameras should be positioned for ignition no later than pick-up of T-9 minutes count. "Spot" scanning after pick-up of the T-9 minute count is acceptable with CICE concurrence.

Cameras may be positioned for SSME ignition non-sequentially.

Camera positions may be altered real-time with CICE concurrence. Alterations should be determined prior to pick-up of T-9 minute count to allow sufficient time for operators to rehearse camera movements with ice console.

The GO₂ Vent Arm (GVA) retracts at T-2m30s.

CVM1 Camera Positions Are Defined As Follows:

004/104

GUCP centered in frame so that GUCP will stay in view throughout SRB "twang".

042/142

At approximately T-1 hour, view and monitor Orbiter access arm while Orbiter hatch is being closed.

At T-7m30s, watch Orbiter access arm retract, then view bipod strut in center of frame, LO₂ feedline fairing in top of frame, and Orbiter hatch in right of frame.

054/154

At T-3m50s, view Orbiter right hand body flap movement, then zoom out with Orbiter/ET umbilicals at approximate frame center, Orbiter trailing edge at frame bottom, and edge of +Y (RH) SRB just in view at frame right.

Table 60-1 CVM1 Camera Positions for Terminal Count

013/113

At **T-2m30s**, watch lift of GO₂ vent arm for debris and nose cone/vent louvers for ice damage. Immediately following lift of GO₂ vent arm, center frame on GO₂ vent louver and then zoom-out so that entire ET movement is seen during SRB 'twang' at SSME ignition.

060/160

At approximately **T-2m30s**, after GO₂ vent arm retracts, go full zoom in for a close-up inspection of the GO₂ vent louver. After CICE concurrence, go full zoom out and position camera with SSV centered and ET nose cone at frame top.

062/162

At approximately **T-2m30s**, after GO₂ vent arm retracts, go full zoom in for a close-up inspection of the -Y GO₂ vent louver. After CICE concurrence, zoom out until ET nose spike is at top of frame with ET centered.

061/161

At approximately **T-4m00s**, verify camera lights are off. Then position camera to view astronaut closing visor at T-2 minutes 00 seconds.

068/168 and 069/169

Immediately after GO₂ vent hood lift, turn lights off to preclude distracting orbiter crew when the GVA rotates to its latchback position.

***** End of Table 60-1 Camera Positions for Terminal Count *****

***** End of Operation 60 *****

03-15-2002
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OMI S6444 J04
APPROVED

OPERATION 70 Group 2 Monitoring - LH₂ Chill Down Thru T-0

Shop: SE
Cntrl Rm Console: FR2
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 15.0

NOTE

Do not perform this operation if launch scrub declared before start of LH₂ Chill Down.

Operation Not Performed: NA

NOTE

This operation monitors LH₂ Barrel and associated components/areas start of LH₂ Chill Down to pre-pressurization via OTV cameras 009/109, 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167.

Steps in this operation are contingent upon progression of launch countdown operations and may be not performed if countdown is terminated.

03-15-2002
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OMI S6444 J04
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LH₂ Chill Down To L-2 Hour Mark

70-1 CVM2 JYVR 138

At start of LH₂ Chill Down, **start** recorders for cameras 009/109, 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167.

ETM *For Fast* Date *4-8-02*
W. RICHARDS Support: COMM

70-2 Record LH₂ Chill Down start date and time (GMT).

LH₂ Chill Down Date *4/8/02* Time *11/19* GMT

ETM *For Fast* Date *4/8/02*
W. RICHARDS

70-3 CVM2 JTV2 225

From start of propellant loading until start of LH₂ Fast Fill on OTV cameras 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167, **monitor/videotape** ET-TPS surfaces. No cryogenic liquid or excessive vapors allowed.

ETM *For Fast* Date *4/8/02*
W. RICHARDS Support: COMM

Not Performed: *NA*

03-15-2002
APPROVED

OMI S6444 J04
APPROVED

70-4 Record LH₂ Slow Fill start date and time (GMT).

LH₂ Slow Fill Date 4/8/02 Time 11 29 GMT

ETM W. Richards Date 4/8/02

Not Performed: NA

70-5 Record LH₂ Fast Fill start date and time (GMT).

LH₂ Fast Fill Date 4/8/02 Time 12 12 GMT

ETM W. Richards Date 4-8-02

Not Performed: NA

70-6 CVM2 JTV2 225

From start of LH₂ Fast Fill until stable replenish mode is established, scan LH₂ Tank. Alternate OTV cameras 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167 and scan/videotape from LH₂ Aft Dome to Intertank.

ETM W. Richards Date 4-8-02

W. RICHARDS

Support: COMM

Not Performed: NA

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OMI S6444 J04
APPROVED

70-7 Record start date and time (GMT) for LH₂ Topping.

LH₂ Topping Date 4-8-02 Time 1318 GMT

ETM W. Richards Date 4-8-02
W. Richards Not Performed: NA

70-8 Record LH₂ Stable Replenish mode start date and time (GMT).

LH₂ Stable Replenish Date 4-8-02 Time 1358 GMT

ETM W. Richards Date 4-8-02
W. Richards Not Performed: NA

70-9 CVM2 JTV2 225

During LH₂ Stable Replenish mode and until time for final scan (approximately L-1.5 hours), on OTV cameras 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 067/167, monitor/videtape ET TPS surfaces including LO₂ Feed Line, LH₂ Feed Line, LH₂ Recirculation Line, LH₂ Aft Dome and manhole covers, LH₂/LO₂ Umbilicals, and TSM LH₂/LO₂ Umbilicals. No cryogenic liquid or excessive vapors allowed.

ETM Mark Wollam Date 4-8-02
MARK WOLLAM Support: COMM
Not Performed: NA

03-15-2002
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OMI S6444 J04
APPROVED

Final SSV Inspection Scan

NOTE

Final SSV Inspection Scan should begin not later than 1.5 hours prior to start of T-9 minute hold (approximately L-2 hours) to allow ample time to finish. Final SSV Inspection Scan shall include the ET, SRB's and the Orbiter.

Final SSV Inspection Scan may be altered or partially performed in the event that time constraints will not permit a complete SSV scan prior to start of T-9 minute hold.

70-10 CVM2 JTV2 225

Perform Final SSV Inspection Scan with OTV cameras 009/109, 033/133, 054/154, 055/155, 056/156, 065/165, 066/166 and 064/164. Scan passes shall view entire SSV with cameras at full zoom in during final scan.

ETM W. RICHARDS Date 4-6-02

W. RICHARDS

Support: COMM

Not Performed: NA

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T-9 Minute Terminal Count

NOTE

Next step performed for terminal count only and may be not performed if launch is scrubbed prior to pick-up of T-9 minute terminal count. Cameras must be positioned for SSME ignition no later than T-9 minutes. 'Spot' scanning after pick-up of the T-9 minute terminal count is acceptable with CICE concurrence.

Cameras may be positioned for SSME ignition in an arbitrary order.

Camera positions may be altered real-time with CICE concurrence. Alterations should be determined prior to pick-up of T-9 minute count to allow sufficient time for OTV operators to rehearse camera movements.

CVM2 camera positions for terminal count are defined in Table 70-1.

70-11 CVM2 JTV2 225

Ref Table 70-1, position cameras 009/109, 033/133, 056/156, 065/165, 066/166 061/161, 070/170, 071/171 and 067/167 for terminal count.

ETM W. Richards Date 4-2-02
W. Richards Support: COMM

Not Performed: NA

70-12 Operation - Group 2 Monitoring - LH₂ Chill Down Thru T-0 complete.

03-15-2002
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OMI S6444 J04
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Table 70-1 - CVM2 Camera Positions for Terminal Count

NOTE

This Table defines CVM2 camera positions for terminal countdown. Cameras should be positioned for ignition no later than pick-up of T-9 minutes count. "Spot" scanning after pick-up of the T-9 minute count is acceptable with CICE concurrence.

The Orbiter access arm (OAA) retracts at T-7M30S. Orbiter body flap movement occurs at T-3m50s.

Cameras may be positioned for SSME ignition non-sequentially

Camera positions may be altered real-time with CICE concurrence. Alterations should be determined prior to pick-up of T-9 minute count to allow sufficient time for operators to rehearse camera movements with ice console.

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Group 2 Camera Positions Are Defined As Follows:

033/133

Full zoom out. LO₂ feed line in frame center and MLP deck at bottom.

055/155

View ET aft dome with MLP deck just out of view at bottom, ET XT-2058 ring frame at frame top and both SRB's just in view at sides.

056/156

View ET aft dome with MLP deck just out of view at bottom. ET XT-2058 ring frame at frame top and both SRB's just in view at sides.

065/165

Full zoom out. SSV centered. MLP deck edge just in view at bottom.

066/166

ET centered. Intertank to LO₂ Barrel splice at frame top with the majority of Orbiter wing in view.

067/167

Center on GUCP for optimum view.

070/170 and 071/171

At T-9m00s, zoom in on space shuttle main engine with camera providing best view. Zoom out on SSME for wide angle view with other camera.

009/109

At approximately T-3m50s, position to view Orbiter body flap and elevons movement. Afterwards, center on LH₂ umbilical with -Y vertical strut at frame top.

061/161

At approximately T-1m30s, tilt-up to GO₂ Vent Footprint. Zoom in. Pause. If footprint is acceptable, zoom out and tilt down to view Orbiter nose/cockpit through liftoff.

***** End of Table 70-1 - CVM2 Camera Positions for Terminal Count *****

***** End of Operation 70 *****

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OPERATION 80 Final Inspection

Shop: SE
Cntrl Rm Console: FR2
OPR: ETM
Zone: PAD A/B
Hazard (Y/N): Y
Duration (Hrs): 3.0

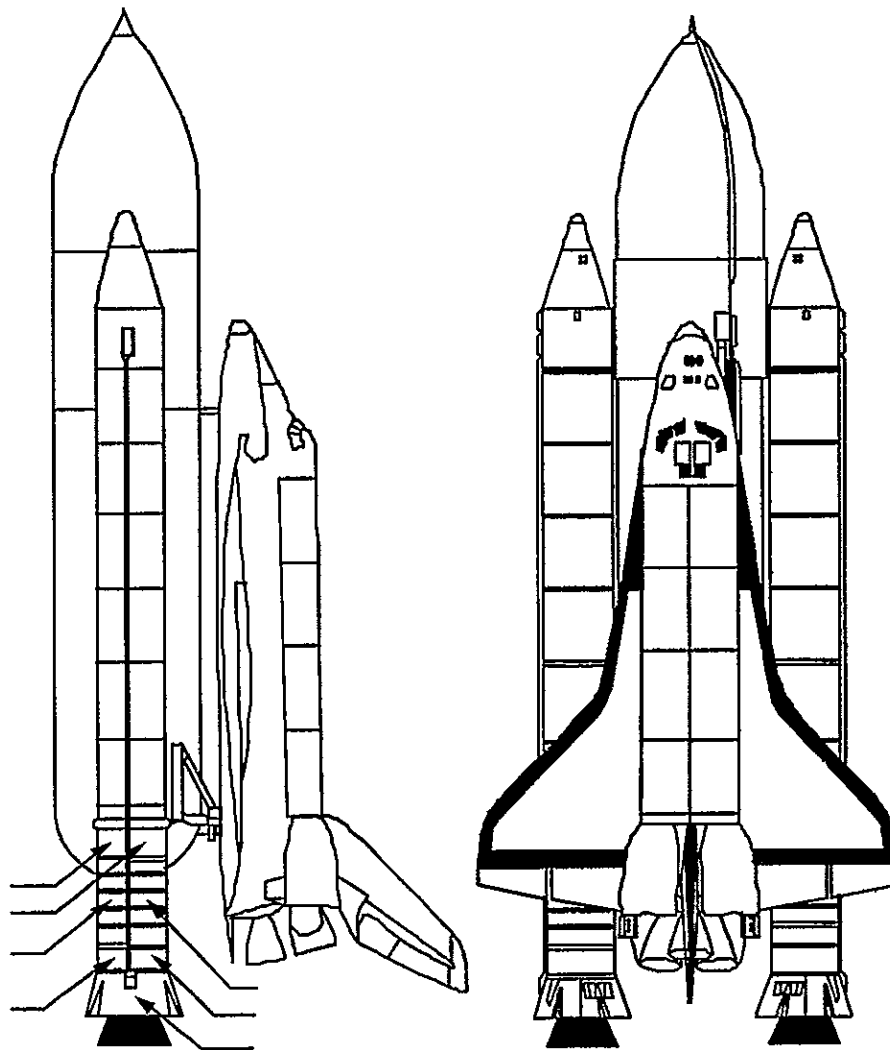
NOTE

Final Inspection may not need to be performed depending on LO₂/LH₂ tanking and launch countdown, as determined by CTC/TTL.

Final Inspection Team stay time guidelines for each level are given in Table 80-1. These guidelines are for reference only and may be deviated from at PICE discretion.

Operation Not Performed: N/A

4-12-95



S6444-F-001

**Figure 80-1: Deck (0) Level
(For Reference Only)**

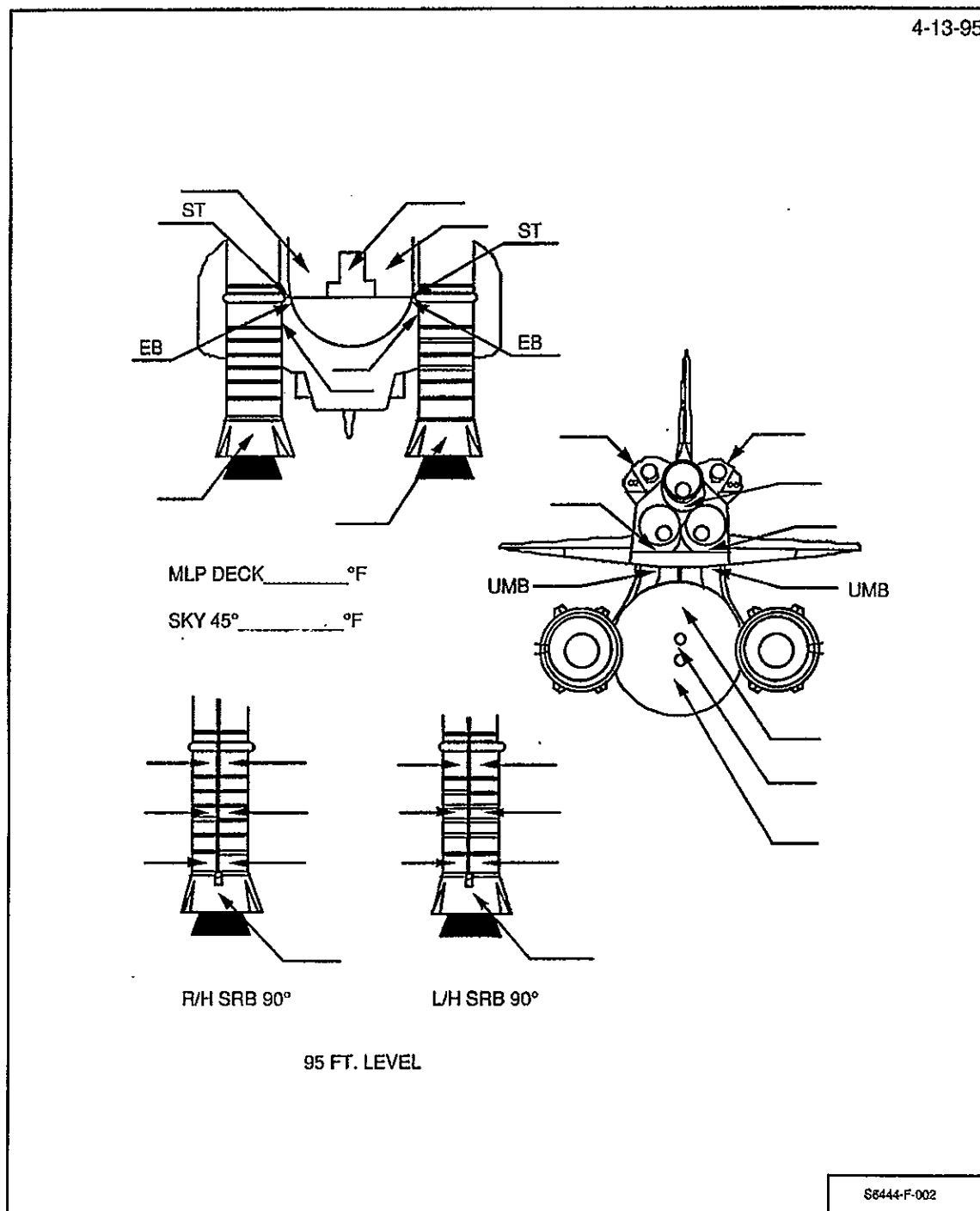
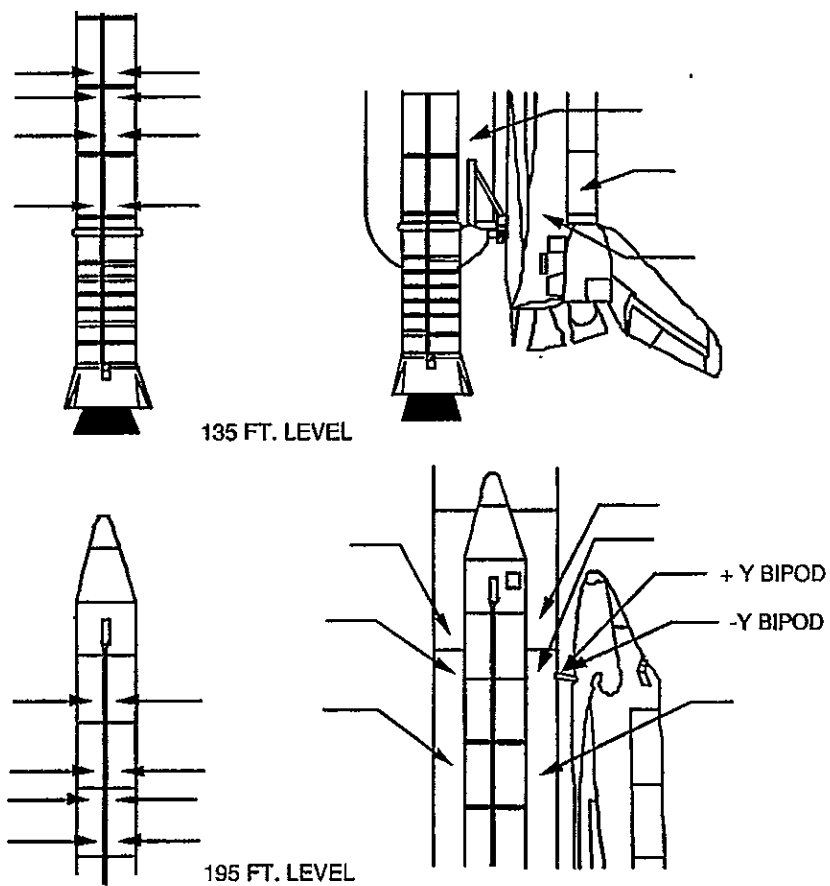


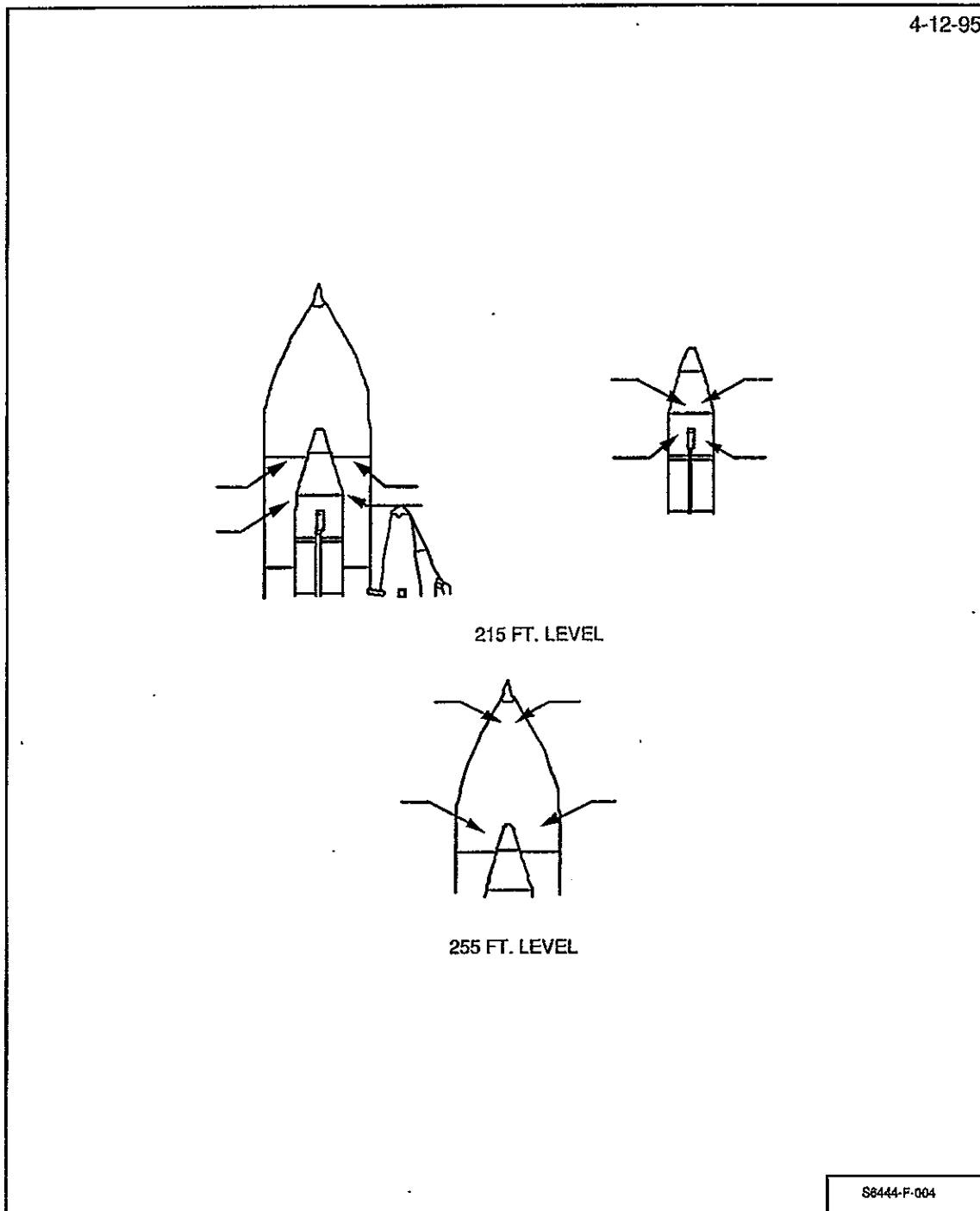
Figure 80-2: Deck (0) and 95 Ft Levels
(For Reference Only)

4-12-95



S6444-F-003

Figure 80-3: 135 and 195 Ft Levels
(For Reference Only)



**Figure 80-4: 215 and 255 Ft Levels
(For Reference Only)**

WARNING

Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

WARNING

Personnel performing final inspection shall be attired in **Nomex coveralls with gloves and hoods**. Personnel shall have available gloves, hoods, and ELSA at all times during walkdown.

Personnel using Sony DKC-ID1 camera shall verify lithium ion battery is securely locked in bayonet connector and the lithium button battery door is locked and taped in place. Personnel shall ensure the flash is not activated on the camera.

Personnel using Kodak DC-50/120 shall verify alkaline batteries are properly installed and the flash is not active on the camera.

Personnel using digital cameras (Sony DKC ID1, Kodak DC-50/120 shall not use these cameras in the presence of a hydrogen leak or an oxygen enriched atmosphere (readings greater than 23 percent O₂).

NOTE

Task Team Leader (TTL) for final inspection is PH-H. Additional personnel (listed below) may be added to the final inspection team with CTC, Launch Director, and Safety concurrence.

JSC Level II	(1)
PH-H	(2)
SFOC ETM	(1)

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80-1 Assemble following final inspection team members:

TTL - PH-H	(1)
PH-H	(1)
SFOC ETM	(2)
LMSSC LSS	(1)
SFOC Safety	(1)

80-2 Final inspection team **perform** walkdown of SSV and associated facilities as follows:

NOTE

Following substep may be not performed with TTL concurrence.

Tables 80-2 and 80-3 are reference only items. Images are to be taken of targets of opportunity. Images must be taken with 35 mm and digital cameras. Digital images shall be inputted into SIMS.

1. Ref Tables 80-2 and 80-3, photograph SSV points of opportunity during final inspection using 35 mm. **Record** data.

Roll No. N/A

Negative No. N/A

Work order No. N/A

Sub Step Not Performed: ^{Richards} W. Richards 4-8-02

2. Reference Tables 80-2 and 80-3, **take** digital image of SSV points of opportunity using digital camera.

Description: Final Inspection Team

SPC No. 5/106

Disc/Frame Nos: 1-18

3. See Figures 80-1 through 80-4, **measure and record** (deg F) SSV external surface temperatures using IR gun(s)/scanners.

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NOTE

The following substep references inspection areas. However, inspection shall not be limited to these areas. Inspection shall be of entire SSV and specific areas of concern as defined by the TTL, CTC, or Launch Director.

4. Visually inspect:

- Orbiter aft engine compartment external surfaces for condensation and ice formations.
- ET TPS surfaces which cannot be observed by the OTV system.
- Specific areas of concern as determined by the TTL, CTC, or Launch Director.

OMRSD S00U00.020-A-1

OMRSD S00U00.020-C-1

USA
VM
026

OMRSD S00U00.020-D-1

80-3 Final Inspection complete. **Verify** no constraints to continue. **Forward** description(s) of debris found to SFOC QC for entry into Processing Debris / FOD Database.

TTL (PH-H) A. Olin Date 4/8/02
SFOC-ETM R Brewer Date 4/8/02

80-4 Operation - Final Inspection complete.

ETM R Brewer Date 4/8/02

MAY 22 2002

Table 80-1 Final Inspection Team Walkdown Stay Times

255 Ft Level - 5 Minutes

- LO₂ Ogive and Barrel acreage
- GO₂ Pressurization Line
- LO₂ Tank Cable Tray
- Visible LH SRB surfaces
- GO₂ Vent Ducts

215 Ft Level - 20 Minutes

- ET GH₂ 7 inch Vent Assembly
- ET acreage (between -Z and -Y axis)
- GO₂ vent area
- Orbiter tiles
- Visible SRB surfaces
- Inter tank-to-LO₂ Barrel splice

195 Ft Level - 10 Minutes

- LO₂ Feed Line
- ET/Orbiter Bipods (side and bottom view)
- -Y ET/SRB forward attachment (bottom view)
- -Y ET/SRB aft attachments (top view)
- Inter tank splice areas (LO₂ and LH₂)
- ET acreage (between -Y and +Z axis)
- Orbiter tiles
- Visible LH SRB surfaces

135 Ft Level - 10 Minutes

- LH₂ ET/Orbiter Umbilical
- -Y ET/SRB C/T
- -Y Vertical Strut
- LO₂ Feed Line
- ET acreage between -Y axis and +Z axis
- ET/Orbiter attachments (top view)
- Visible LH SRB surfaces
- Orbiter aft fuselage

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Table 80-1 Final Inspection Team Walkdown Stay Times
0 Level - 30 Minutes

- LH₂ Aft Dome
- ET acreage around +Z axis
- ET acreage around -Z axis
- LO₂ Feed Line
- LH₂ Feed Line
- ET/Orbiter attachments - Bottom view
- ET/Orbiter LH₂ and LO₂ Umbilicals
- T-0 LH₂ and LO₂ Umbilicals
- Space Shuttle Main Engines (SSME)
- Orbiter tiles
- ET/SRB aft attachments
- Visible SRB surfaces
- SRB ignition overpressure sound suppression water troughs

***** End of Table 80-1- Final Inspection Team Walkdown Stay Times *****

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Table 80-2 Final Inspection Team - Telephotos

TELEPHOTOS - 255 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Notes</u>
GO ₂ Vent Ducts	Horizontal	
LO ₂ Acreage	Vertical	

TELEPHOTOS - 215 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Notes</u>
-Y Bipod Ramp	Horizontal	From RSS
LO ₂ P/L Ice Frost Ramps	Vertical	From RSS; Requires 3-4 shots
GO ₂ Seal/Hood	Horizontal	From haunch & RSS
GUCP	Vertical	

TELEPHOTOS - 195 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Notes</u>
-Y Bipod Ramp & Jack PAD C/O	Horizontal	

TELEPHOTOS - 135 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Notes</u>
LH ₂ UMB	Horizontal	
-Y Longeron	Vertical	If needed
Jack Pad Closeouts	Horizontal	
LH ₂ Acreage	Vertical	

03-15-2002
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APPROVED

Table 80-2 Final Inspection Team - Telephotos

TELEPHOTOS - MLP

<u>Photo</u>	<u>Camera Orientation</u>	<u>Notes</u>
LH ₂ UMB	Horizontal	From West
LH ₂ UMB	Horizontal	From NW
EB-7	Horizontal	
EB-8	Horizontal	
LH ₂ Aft Dome	Horizontal	
Third Hard Point C/O	Vertical	
LH ₂ Barrel	Horizontal	From North
SSV Overall	Horizontal	From North
SSV Overall	Horizontal	From East
LO ₂ F/L Bracket & Bellows	Vertical	XT-1973
LO ₂ F/L Bracket	Vertical	XT-1871
LO ₂ F/L Bracket	Vertical	XT-1623
LO ₂ F/L Bracket	Vertical	ST-1377 & XT-1129
LO ₂ F/L Bracket & Bellows	Vertical	XT-1129 & XT-1106 from SE
LO ₂ P/L & C/T	Vertical	From SE

600 MM PHOTOS - 255 FT LVL

<u>Photo</u>	<u>Shutter Speed</u>	<u>Notes</u>
GO ₂ Vent Ducts	1/30	Contingency

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Table 80-2 Final Inspection Team - Telephotos

600 MM PHOTOS - 215 FT LVL

<u>Photo</u>	<u>Shutter Speed</u>	<u>Notes</u>
-Y GO ₂ Seal	1/30	
-Y Bipod Ramp	1/30	Contingency
Jack Pad C/O's	1/4	Difficult if windy
LO ₂ F/L	1/15	
-Y Vertical Strut (Crack)	1/30	

600 MM PHOTOS - 195 FT LVL

<u>Photo</u>	<u>Shutter Speed</u>	<u>Notes</u>
-Y Bipod Ramp	1/30	Contingency

600 MM PHOTOS - 135 FT LVL

<u>Photo</u>	<u>Shutter Speed</u>	<u>Notes</u>
LH ₂ UMB	1/30	
-Y Vertical Strut (Crack)	1/60	
LO ₂ F/L Bellows	1/15	Contingency

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Table 80-2 Final Inspection Team - Telephotos

600 MM PHOTOS - MLP

<u>Photo</u>	<u>Shutter Speed</u>	<u>Notes</u>
LH ₂ UMB	1/30	From West
LH ₂ UMB	1/30	From NW
LH ₂ UMB	1/30	From East
LH ₂ UMB Actuator C/O	1/15 or 1/30	From North standing next to water pipe
LO ₂ UMB	1/5	Lower Inboard
LO ₂ UMB	1/8	Inboard
LO ₂ F/L Bracket & Bellows	1/15	One photo to include XT-1978 & XT-1973
LO ₂ F/L Bracket	1/15	XT-1871
LO ₂ F/L Bracket	1/15	XT-1623
LO ₂ F/L Bracket	1/15	XT-1377
LO ₂ F/L Bracket	1/30	One photo to include XT-1129 & XT-1106
LO ₂ F/L Bracket	1/30	From SE corner; One photo to include XT- 1129 & XT-1106
Jack Pad C/O's	1/15	From SE corner
Ice Frost Ramps or Pal Ramps	1/15 or 1/30	Contingency
LH ₂ UMB Inboard	1/15	From East
+Y Longeron	1/15 or 1/30	Contingency
-Y Longeron	1/15	Contingency

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Table 80-2 Final Inspection Team - Telephotos

WIDE ANGLE PHOTOS - 255 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LO ₂ Tank	Vertical	35-70 mm	
GO ₂ Vent Ducts	Horizontal	35-70 mm	

WIDE ANGLE PHOTOS - 215 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
Overall GH ₂ Vent Line	Horizontal	35-70 mm	
Orbiter Nose, ET -Y Side	Horizontal	35-70 mm	
Orbiter Nose, ET -Y, +Z Side	Horizontal	35-70 mm	From RSS
Forward Half of Vehicle	Vertical	28 mm	From RSS
Entire Orbiter	Vertical	28 mm	From RSS

WIDE ANGLE PHOTOS - 195 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
Aft Part of SSV, LH Wing	Vertical	35-70 mm	
Orbiter Fwd Section, Upper LH ₂ Tank	Vertical	35-70 mm	
Bipod, -Y, +Z Intertank Area	Horizontal	35-70 mm	

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Table 80-2 Final Inspection Team - Telephotos

WIDE ANGLE PHOTOS - 135 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
Orbiter Aft Section	Vertical	35-70 mm	
Lower LH ₂ Tank & LH SRB	Vertical	35-70 mm	

WIDE ANGLE PHOTOS - MLP

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
Overall Orbiter Left Side	Vertical	28 mm	
ET -Y, +Z Quadrant	Vertical	28 mm	
ET -Z Side	Vertical	28 mm	
ET +Y, +Z Quadrant	Vertical	28 mm	
Overall Orbiter Right Side	Vertical	28 mm	
ET Aft Dome	Horizontal	35-70 mm	
-Z Side of LO ₂ T-0; RCS Stinger	Horizontal	35-70 mm	
+Z Side of LO ₂ T-0; RCS Stinger OMS Nozzle	Horizontal	35-70 mm	
-Z Side of LH ₂ T-0; RCS Stinger	Horizontal	35-70 mm	
+Z Side of LH ₂ T-0; RCS Stinger OMS Nozzle	Horizontal	35-70 mm	
Overall SSME Cluster	Horizontal	50 mm	-Y Side
SSME No. 2	Horizontal	50 mm	
SSME No. 1, -Z Side	Horizontal	50 mm	
SSME No. 3	Horizontal	50 mm	
Overall SSME Cluster	Horizontal	50 mm	+Y Side

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Table 80-2 Final Inspection Team - Telephotos

WIDE ANGLE PHOTOS - MLP (continued)

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LO ₂ UMB Area	Horizontal	35-70 mm	
LH ₂ UMB Area	Horizontal	35-70 mm	
ET/ORB UMB & ORB Lower Surface	Horizontal	28 mm	From under ET

*** End of Table 80-2 Final Inspection Team - Telephotos ***

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Table 80-3 Reduced Final Inspection Team Photos

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 255 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
GO ₂ Vent Ducts	TELE	Horizontal	

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 215 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
-Y Bipod Ramp	Horizontal	TELE	From RSS
LO ₂ P/L Ice/Frost Ramps	Vertical	TELE	From RSS; 2 photos required
GO ₂ Seal/Hood	Horizontal	TELE	From RSS
GUCP	Vertical	TELE	
Fwd Half of SSV	Vertical	28 mm	From RSS
Entire Orbiter	Vertical	28 mm	From RSS

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 195 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
-Y Bipod Ramp & Jack Pad C/O's	Horizontal	TELE	

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Table 80-3 Reduced Final Inspection Team Photos

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - 135 FT LVL

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LH ₂ UMB	Horizontal	TELE	
Orbiter Aft Section	Vertical	35-70 mm	

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - MLP DECK

<u>Photo</u>	<u>Camera Orientation</u>	<u>Lens</u>	<u>Notes</u>
LH ₂ UMB	Horizontal	TELE	From West
ET Aft Dome	Horizontal	TELE	
Aft Hard Point Closeout	Vertical	TELE	
LH ₂ Tank	Horizontal	TELE	From North
LO ₂ Tank	Horizontal	TELE	From North
LO ₂ Tank	Horizontal	TELE	From East
LO ₂ F/L Bracket Bellows	Horizontal	TELE	XT - 1978 & XT - 1973
LO ₂ F/L Bracket	Horizontal	TELE	XT - 1871
LO ₂ F/L Bracket	Horizontal	TELE	XT - 1623
LO ₂ F/L Brackets	Horizontal	TELE	XT - 1377 & XT - 1129
LO ₂ F/L Brackets & Bellows	Horizontal	TELE	XT - 1129 & XT - 1108; from SE
LO ₂ P/L & C/T	Horizontal	TELE	From SE
Overall Orbiter Left Side	Vertical	28 mm	
ET -Z Side	Vertical	28 mm	
Overall Orbiter Right Side	Vertical	28 mm	
Overall SSME Cluster -Y Side	Horizontal	28 mm	

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Table 80-3 Reduced Final Inspection Team Photos

WIDE ANGLE & TELEPHOTO PHOTOGRAPHY - MLP DECK (continued)

Overall SSME Cluster +Y Side	Horizontal	28 mm	
ET/Orb UMB & Orbiter Lower Surface	Horizontal	28 mm	From under ET

*** End of Table 80-3 - Reduced Final Inspection Team Photos ***

*** End of Operation 80 ***

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OPERATION 90 LO₂/LH₂ Drain Monitoring

Shop: SE
Cntrl Rm Console: FR2
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 4.0

NOTE

This operation is contingent upon progression of launch countdown and is performed after start of cryo (LO₂/LH₂) loading and subsequent launch scrub, FRF, or WCDDT.

Operation Not Performed:

ET/05

4-8-02

NOTE

This operation monitors the External Tank external surfaces during LO₂/LH₂ drain operations from time of detanking until 1.5 hours after LO₂/LH₂ low level sensors read dry via OTV 004/104, 009/109, 013/113, 033/133, 042/142, 054/154, 055/155, 056/156, 060/160, 061/161, 062/162, 063/163, 064/164, 065/165, 066/166, 067/167, 068/168, 069/169, 070/170, and 071/171.

Noted requirements satisfied by this operation: OMRS S00E00.021

90-1 Record start date/time (GMT) of LH₂ and LO₂ Tank Drain.

LH₂ Drain Start Date N/A Time N/A GMT

LO₂ Drain Start Date N/A Time N/A GMT

ETM N/A Date N/A

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90-2 CVM1 JTV1 223

From start of LO₂ Tank Drain and LH₂ Tank Drain until respective LO₂/LH₂ low level sensors read dry, **monitor** ET external surfaces including LO₂ Feed Line, LH₂ Feed Line, LH₂ Recirculation Line, LH₂ Aft Dome and manhole covers, LH₂/LO₂ Umbilicals, TSM LH₂/LO₂ Umbilicals via OTV cameras. No cryogenic liquid or excessive vapors allowed.

ETM _____ *N/A* Date _____

Support: COMM

90-3 Record date/time (GMT) when LO₂/LH₂ low level sensors read dry.

LH₂ Sensors Dry Date _____ Time _____ GMT

LO₂ Sensors Dry Date _____ Time _____ GMT

ETM _____ *N/A* Date _____

Handwritten initials

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OPERATION 100 Console Securing

Shop: SE
Cntrl Rm Console: FR2
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 0.5

100-1

CTIF	TBC	136
TBC	CTC	232

OTV support for ET thermal protection system evaluation no longer required.

100-2

CTIF	JYVR	138
-------------	-------------	------------

Perform the following:

- 1. Turn off video recorders.**
- 2. Remove tape cartridges.**
- 3. OTV support no longer required.**

Support: COMM

100-3

CTIF	CVM1	222
	CVM2	

Secure consoles by setting all monitors to "Off" position.
Report completion.

03-15-2002
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NOTE

Perform next step only after a successful launch.

100-4

CTIF

Remove photo processing laptop computer from Firing Room.

15/03

Not Performed: N/A

100-5

CTIF	TBC	136
TBC	CTC	232

Firing Room 2, ice frost monitoring area securing complete.

100-6

Operation 100 - Console Securing complete.

ETM

15/03

Date

4/8/02

*** End of Operation 100 ***

03-15-2002
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OPERATION 110 Summary Tape

Shop: SE
Cntrl Rm Console: FR2
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 18.0

NOTE

Observations/concerns observed during count are typically recorded on the summary tape real-time (trouble tape).

110-1 CICE

After launch or launch scrub, prepare a summary tape to include observations/concerns noted during count.

110-2 Operation Summary Tape complete.

ETM ETM Date 4/8/02

*** End of Operation 110 ***

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OPERATION 120 Post Drain Walkdown

Shop: SE
Cntrl Rm Console: NA
OPR: ETM
Zone: PAD A/B
Hazard (Y/N): Y
Duration (Hrs): 2.0

NOTE

Post drain walkdown performed only after start of cryo (LH₂/LO₂) loading and subsequent launch scrub.

Operation Not Performed: 

4-8-02

WARNING


Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

Personnel shall wear **hardhats** and **flame retardant coveralls** while performing post drain walkdown.

NOTE

Post drain walkdown typically commences approximately 1.5 hours after LH₂/LO₂ low level sensors read dry.

Post drain walkdown performed in support of a 24 hour scrub turnaround is typically coincident with the L-20 hour pre-launch walkdown for the ensuing launch attempt.

*Page 120-34
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NOTE

NASA ET Mechanical Engineer (PH-H) or designee shall function as team leader. Following personnel are walkdown optional participants:

NASA Engr	(4)
SFOC Engr	(2)
LMSSC-LSS	(1)
Boeing LSS	(1)
SFOC Safety	(1)

- 120-1** NASA Lead ET Mechanical Systems Engineer (PH-H) verify essential personnel on station, properly attired, and ready to proceed with post drain walkdown.

Essential Personnel	
NASA Engineering (PH-H)	1
SFOC Engineering (ETM)	1

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OPERATION 130 Post Launch Walkdown

Shop: SE
Cntrl Rm Console: NA
OPR: ETM
Zone: PAD A/B
Hazard (Y/N): Y
Duration (Hrs): 3.0

NOTE

Do not perform this operation after launch scrub.

Operation Not Performed: N/A

WARNING

Personnel working at heights greater than 4 feet and within 6 feet of an unguarded edge shall wear a **safety harness** with a **lanyard** secured to an approved tie off point, substantial structural member (no handrails) or a properly installed life line.

Personnel participating in walkdown shall wear **hardhats** and **flame retardant coveralls**.

NOTE

NASA ET Mechanical Engineer (PH-H) or designee shall function as team leader. Following personnel are walkdown optional participants:

NASA Engr	(3)
SFOC Engr	(2)
LMSSC-LSS	(1)
Boeing LSS	(2)
SRB ELE	(1)
Thiokol-LSS	(1)
SFOC Safety	(1)
Pad Mgmt Rep	(1)

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- 130-1 NASA (PH-H) verify following personnel on station, properly attired, and ready to proceed with post launch walkdown.

Essential Personnel		
NASA	PH-H	1
SFOC	ETM	1

NOTE

Post Launch Walkdown must be performed prior to washdown and Pad being opened for normal work.

- 130-2 Perform Post Launch Walkdown as follows:

1. Ref Table 130-1, **visually inspect** post launch pad/area to identify any lost flight or ground systems hardware and debris sources.
2. Ref Table 130-2, **document/SIMS photograph** launch PAD area configuration.

Description: Post Launch Walkdown

OMRSD S00U00.010-1

USA
VH
02

SPC No. 51169

Disc/Frame Nos: 1-14/15-39/40-53

- 130-3 Walkdown complete. Debris sources and lost flight hardware identified. No constraints to continue. **Forward** description(s) of debris found to SFOC QC for entry into Processing Debris / FOD Database.

PH-H *Amundolo* Date 4/8/02

ETM *R Brewer* Date 4/8/02

- 130-4 Operation - Post Launch Walkdown complete.



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Table 130-1 Post Launch Walkdown Inspection Areas

Record mission info, PAD, date, and time:

STS 110

PAD B

Date 4/8/02

Time 18:15

SRB Hold-down posts (HDP)

Inspect for damage, stud hang-up Epon shim material, ordnance fragments, doghouse blast covers, erosion, missing hardware, debris. Record Results:

ALL ITEMS APPEAR TO BE GOOD FOR
AFTER LAUNCH INSPECTION. NO 'STUD' HANG
UP - NO OBVIOUS MISSING HARDWARE - MINOR
DEBRIS.

MLP Deck

SRB aft skirt purge lines
SRB T-0 umbilicals
Tail service masts (TSM's)
MLP deck

195 Ft Level

Orbiter access arm (OAA)

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Table 130-1 Post Launch Walkdown Inspection Areas

215 Ft Level - GH2 Vent Line/GUCP

Latch position
Loose cables
Damage from SRB plume
Damage to the QD

255 Ft Level - GO₂ Vent Arm, Ducts, Hood

Seals
Hood windows, doors, latches

Fixed Service Structure (FSS)

Cable tray covers
Signs
Hydraulic leaks
Slidewire baskets

PAD Apron/Acreage

Vehicle hardware and/or flight TPS materials
Facility debris

Table K-1 PAD Apron/Acreage Items

<u>Description</u>	<u>Location</u>
NONE FOUND	

*** End of Table 130-1 - Post Launch Walkdown Inspection Areas ***



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Table 130-2 Post Launch Photos (MLP, FSS, PAD, Apron, Pad Acreage)

MLP 0-level

1 Ea HDP No. 1, 2, 5 & 6 (HDP shoe and Epon shim)
1 Ea HDP No. 3, 4, 7 & 8 (blast cover down to HDP base)
1 Ea SRB T-O umbilical
1 Ea overall view SRB exhaust cutouts\

Any unusual or debris-related damage to the facility; sound suppression water pipes,
TSM's cracks in MLP deck, witness panels, handrails, etc.

Any flight hardware debris (tiles, SRB ordnance fragments)
Any facility debris (nuts, bolts, cable tray covers, etc.)

FSS

Close-ups of GUCP and latching mechanism
Overall views of GO₂ vent hood/ducts, if damaged
Any flight hardware or facility debris
Any unusual or debris-related damage to the facility

PAD Apron/PAD Acreage

Any flight hardware or unusual facility debris objects

Any unusual or debris-related damage to the PAD (such as missing brick in the flame
trench), perimeter fence, etc.

***** End of Table 130-2 - Post Launch Photos (MLP, FSS, PAD, Apron, Pad
Acreage) *****

***** End of Operation 130 *****

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OPERATION 140 Film Review

Shop: SE
Cntrl Rm Console: NA
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 15.0

NOTE

This operation may be not performed after launch scrub.

Operation 140 Not Performed: N/A

NOTE

Analysis of Pad Debris Inspection Results determines priority for film review. All critical film (as determined by the Debris Team) must be reviewed as soon as possible after launch and no later than 36 hours prior to entry (of the Orbiter into the earth's atmosphere).

140-1 Review and analyze all engineering launch (and flight) film to:

- Identify any debris damage to the SSV
- Identify flight vehicle or ground system damage that could affect Orbiter flight operations of future SSV launches.

OMRSD S00U00.011-1

USA
VM
026

ETM R Brewer Date 4/9/02

140-2 Operation - Film Review complete.

ETM R Brewer Date 4/10/02

*** End of Operation 140 ***

03-15-2002
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OPERATION 145 IR Camera Removal

Shop: PH-H
Cntrl Rm Console: NA
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 2.0

WARNING

Hard hats required on the Pad when SSV is not present.

CAUTION

Exercise care to avoid dropping equipment, fasteners, etc from RSS roof to prevent damage to equipment or injury to personnel. All tools must be tethered.

NOTE

IR Camera removal from RSS Roof site may be not performed in launch scrub turnaround scenarios.

145-1 Remove IR camera at RSS Roof Site as follows.

1. **Remove** fasteners (2 pl) from camera housing front. **Retain** fasteners for reinstallation when front cover is installed.
2. **Install** camera housing front cover using previously removed fasteners (2 pl). **Tighten** fasteners (2 pl) wrench tight.

WARNING

Power cable is live. Care should be exercised when connecting power cable to avoid electric shock.

CAUTION

Do NOT allow back cover to exert undue force on cables when opening/rotating back cover.

3. **Rotate** camera housing back cover into open position by removing bolts with flat washers (20 pl). **Retain** bolts/washers for reinstallation.
4. **Disconnect:**
 - Power cable
 - Pan & tilt cable
 - Controller cable
 - OTV coaxial cable
5. **Unlock** spring pin at lower, left to release IR camera Unit in camera housing. **Remove** IR Camera Unit from camera housing by carefully sliding it out the back opening of the camera housing. **Support** IR Camera Unit during removal.
6. **Rotate** camera housing back cover into closed position. Do not pinch cables. **Secure** back cover by reinstalling bolts/flat washers (20 pl). **Tighten** bolts wrench tight.

03-15-2002
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OMI S6444 J04
APPROVED

WARNING

Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system. Ensure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear **N-Dex nitril gloves** and **chemical splash goggles**. When working at eye level or above wear a **face shield** over goggles.

WS002.a 05-22-01

7. **Clean** IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rymple cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl alcohol.
8. **Route** IR Camera Unit to VAB 3K1 for refurb/checkout.

NASA PH-H *A. Duru* Date *4/10/02*

USA ETM *R Brewer* Date *4/10/02*

Not Performed: *N/A*

NOTE

IR Camera removal from Camera Site 2 may be not performed in launch scrub turnaround scenarios.

145-2 **Remove** IR camera from Camera Site 2 as follows.

1. **Remove** bolt(s) from camera housing front. **Retain** bolt(s) for reinstallation when front cover is installed.
2. **Install** camera housing front cover using previously removed bolt(s). **Tighten** bolt(s) wrench tight.

WARNING

Power cable is live. Care should be exercised when connecting power cable to avoid electric shock.

CAUTION

Do NOT allow back cover to exert undue force on cables when opening/rotating back cover.

3. **Loosen** screws (8 pl) securing camera housing back cover using Phillips screwdriver. **Rotate** camera housing back cover to open position. **Retain** bolts/washers for reinstallation.
4. **Disconnect:**
 - Power cable
 - Pan & tilt cable
 - Controller cable (2 pl)
 - OTV coaxial cable
5. **Unscrew** set screw(s) at lower, left/right to release IR camera Unit in camera housing. **Remove** IR camera Unit from camera housing by carefully sliding it out the back opening of the camera housing. **Support** IR camera Unit during removal.
6. **Coat** camera housing back cover O-ring with a single coat of (1) tube/jar 6505-00-133-8025 Petroleum Jelly, Vaseline (or equivalent) .
7. **Rotate** camera housing back cover into closed position. Do not pinch cables. **Secure** back cover by installing screws (8 pl). **Tighten** screws wrench tight using Phillips screwdriver.

03-15-2002
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WARNING

Isopropyl Alcohol is flammable and is a skin, eye and respiratory tract irritant that affects the central nervous system. Ensure adequate ventilation, avoid inhalation of vapors and do not use near heat, sparks or open flame. Skin contact may cause redness and pain eye contact will cause severe eye irritation and may result in permanent damage. Inhalation of vapors in high concentrations has a narcotic effect on the central nervous system. Personnel shall wear N-Dex nitril gloves and chemical splash goggles. When working at eye level or above wear a face shield over goggles.

WS002.a 05-22-01

8. Clean IR Camera Unit lens plate using (1) roll 8305-00-519-3144 Rymple cloth dampened with (4) ounces 6810-00-543-7915 Isopropyl alcohol.
9. Route IR Camera Unit to VAB 3K1 for refurb/checkout.

NASA PH-H *[Signature]* ^{A. Oviu} Date 4/18/02
USA ETM *[Signature]* Date 4/18/02

Not Performed: N/A

*** End of Operation 145 ***

03-15-2002
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OPERATION 150 Final Report

Shop: SE
Cntrl Rm Console: NA
OPR: ETM
Zone: NA
Hazard (Y/N): N
Duration (Hrs): 0.5

NOTE

This operation may be not performed after launch scrub.

Operation 150 Not Performed: N/A

150-1 Assemble final report by attaching following reports to this OMI.
Reference each to this step.

Post Launch PAD Assessment
SRB Assessment
Launch Film Review
Launch Day Video Review
Orbiter Landing Assessment
ET Separation Review

150-2 Final report assembly complete.

ETM R Brewer Date 4/26/02

150-3 Operation - Final Report complete.

*** End of Operation 150 ***

OMI- 56444 - STCP 150-1
STS-110 POST LAUNCH PAD DEBRIS INSPECTION REPORT
KSC Debris Team
8 April 2002

The post launch inspection of the MLP-3, Pad B FSS and RSS was conducted on 8 April 2002 from Launch + 1.75 to 3.75 hours (1815 to 2015 EST).

No flight hardware was found.

Orbiter liftoff lateral acceleration data to predict stud hang-ups received from Boeing-Huntington Beach indicated that no SRB holddown stud hang-up had occurred, the reported value was 0.14G. Evaluation of the MLP 0-level was performed and the south holddown studs were visually assessed as having no indication of hang-up. Erosion was typical for the north posts with some evidence of missing RTV at the HDP haunch interface. North holddown post blast covers and T-0 umbilical exhibited minimal exhaust plume damage. Both SRB aft skirt GN2 purge lines were intact, protective tape layering was partially eroded on the RH side and the metal braid was exposed on the LH purge line.

The LO2 and LH2 Tail Service Masts (TSM) appeared undamaged, the LO2/LH2 bonnets were observed to be fully closed. The MLP deck was in generally good shape. All MLP deck communication connector caps were found intact and secured. Removable handrail on Side 4 was found to have been partially displaced, the floor plate was missing one fastener and one loose in place.

The GH2 vent line latched on the 4th tooth of the FSS latching mechanism. The vent line was displaced to the south and contacted the north stabilizer rod. Inspection of the area did not reveal any indication of the vent line having made contact with the FSS. GUCP and 7-inch QD exhibited no damage, the poppet was observed to be intact. The deceleration cable was in nominal configuration, and the vent line blanket was sooted and torn.

The OAA appeared to be intact with no evidence of plume impingement.

All slidewire baskets were secured with no evidence of damage.

The GOX vent arm, ducts and structure appeared to be in good shape with no indications of plume damage.

Debris findings included:

- FSS 235' level - loose uni-strut clamp and fasteners found
- Pad surface SW near RSS truck - Z shaped metal panel flashing 9'(long) x 4"(wide)
- North Flame Trench - Metal Object ~ 5' - 8" x 3"(half round) believed to MLP flame hole panel batten

Overall damage to the pad appeared to be minimal.

Jorge Rivera NASA KSC
Michael Payne NASA KSC
Carlos Ortiz Boeing HB

1122

OMI-6444-Step 150-1
STS-110 SRB POST FLIGHT/RETRIEVAL ASSESSMENT
KSC Debris Team
11 April 2002

The BI-112 Solid Rocket Boosters were inspected for debris damage and debris sources at CCAFS Hangar AF on 11 April 2002. Generally, both boosters were in excellent condition.

ANOMALIES

None

FUNNIES

None

OBSERVATIONS

The TPS on both frustums exhibited no debonds/unbonds. There was minor localized blistering of the Hypalon paint.

All eight BSM aero heat shield covers had fully opened and locked, but two RH and two LH cover attach rings had been bent at the hinge by parachute riser entanglement.

The forward skirts exhibited no debonds or missing TPS. RSS antennae covers/phenolic base plates were intact. All primary frustum severance ring pins and retainer clips were intact with the exception of two missing pins and retainer clips on the left SRB. Parachute riser entanglement most likely caused this.

The Field Joint Protection System (FJPS) and the System Tunnel Covers closeouts were generally in good condition with no unbonds observed.

Separation of the aft ET/SRB struts appeared normal.

Aft skirt external surface TPS was in good condition. Typical blistering of Hypalon paint had occurred on the insulation close-outs and GEI cork runs.

The holddown post Debris Containment Systems (DCS) appeared to have functioned normally on all HDP's.

No indication of stud hang up was observed.

Armando Oliu
NASA - KSC

MAY 22 '02

SPC
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OMI-6444-Step/50-1

STS-110 POST LAUNCH FILM REVIEW

KSC Photo/Video Analysis Team

9 April 2002

Significant Anomalies

None

Minor Anomalies

None

Funnies

None

Observations

GUCP separation and retraction appeared normal (E-33). GH2 vent line appeared to contact deceleration cable slightly south of center. Positive capture was achieved on the vent line latch with the latching mechanism centered in latching plate. (E-39, E-43) The hydrogen vent line pivot arm showed no rebound. (E-61)

Several ice particles from the GH2 disconnect fell at T-0. (E-33, E-34, E-61, E-64) Two ice particles contacted LH SRB shortly after T-0. No damage noted. (E-33)

Umbilical purge barrier baggie material fell during and after roll maneuver. (E-52, E-54, E-207, E-213, E-222) One piece of purge barrier detached from the umbilical and was caught in turbulent flow directing it toward ET aft dome and then under the body flap, in between SSME's #2 and #3 prior to being ejected aft in the exhaust of SSME #1. Additional large purge barrier baggie portion was observed falling past body flap at GMT 20:44:47.956.

SRB separation appeared normal. (E-207, E-208, E-212)

Particles of SRB aft-skirt instafoam fell along side the SRB plume. (E-207, E-208, E-212, E-223)

OMS-assist firing was visible shortly after SRB separation. (E-207, E-212)

Localized flow condensation at various points on the vehicle were typical. (E-207, E-208, E-212, E-213, E-222)

SSME Mach diamond formation sequence was 2-3-1 (E-76)

Free-burning GH2 blown south under body flap. (E-52, E-76)

Body flap movement during ascent was typical. (E-207, E-212, E-220)

Ice particles fell from ET/ORB umbilicals after lift-off. No impact to orbiter lower surface was noted. (E-31, E-34, E-36, E-52, E-63)

Charring on the ET aft dome was typical. (E-207, E-208, E-213, E-223, E-224)

Forward RCS paper covers were observed falling aft during early ascent. (E-52, E-54, E-207, E-213, E-222, E-223)

MAY 22 02

Numerous small debris particles entered field of view well after vehicle clears tower. (E-63).

Throat plug material ejected from SRB exhaust hole after T-0. No contact with vehicle. (E-52)

Numerous flashes in SSME plume were observed during ascent. (E-207, E-212, E-220, E-222, E-223)

Notes

Review of high-speed films will continue on Wednesday, April 10, 2002.

Armando Oliu

Scott Otto

NASA -- KSC

Lockheed Martin -- KSC

OM#-5644-Step 150-1

STS-110 POST LAUNCH FILM REVIEW
KSC Photo/Video Analysis Team
10 April 2002

SIGNIFICANT ANOMALIES

None.

MINOR ANOMALIES

Two pieces of facility debris appears from under the raise deck adjacent to the SSME exhaust hole and near the LH2 TSM during SSME ignition. Shortly after T-0 the debris is blown across the MLP deck (away from the flight hardware) until it leaves the field of view. The debris appears to be two portions (1 to 3 foot in length) of either electrical cable or tygon tubing. (E-3)

FUNNIES

None.

OBSERVATIONS

No stud hang up were observed on any of the SRB hold-down posts.

SRB holddown post shoe rocked slightly on HDP's #1 and #6. (E-9, E-13) There was substantial holddown post shoe rock on HDP #2. (E-8)

GH2 vent line retraction appeared normal. No rebound observed from the pivot arm assembly. (E-41, E-42)

Small pieces of FSS facility debris enters field of view prior to T-0. No contact with vehicle. (E-42)

No OMS pod flexing observed. (E-17, E-18)

Deluge water pipe leaking near HDP 3. (E-7, E-10)

Two tile surface chips were noted from base heat shield. Largest one appeared between SSME #1 and #2. Tile surface coating loss was also observed from the aft face of the RH RCS stinger. This is a common occurrence due to SSME ignition acoustics.

Free-burning GH2 blown under body flap by wind during SSME ignition.

Several ice particles fell from ET/ORB umbilicals during SSME ignition.

Vapors on ET aft dome and SRB stiffener rings were observed after T-0.

Ice particles fell from LH2 / LO2 TSM T-0 disconnects.

Small particles of deck debris were blown across MLP deck.

SRB throat plug and water trough material ejected from exhaust hole. No contact with vehicle.

GO2 vent hood movement is visible after vehicle clears tower.

NOTES

All high speed film items have been reviewed.

No anomalies were observed in the films and videos that would be a concern for re-entry and landing.

Armando Oliu
NASA -- KSC

OMI-¹6444-Step/50-1

STS-110 LAUNCH DAY VIDEO REVIEW
KSC Photo/Video Analysis Team
8 April 2002

Significant Anomalies

None

Minor Anomalies

None.

Funnies

None.

Observations

Tile chip was visible on upper surface of body flap to the right of SSME #3 bell. (OTV 170)

Numerous pieces of ice from the ET/ORB umbilical shook loose and contacted umbilical sill tiles, but no damage was detected. (OTV 109, 154, 163).

Free burning hydrogen blown under body flap by the wind. (OTV 163, 170, 171).

LH2 and LO2 T-0 umbilical disconnect was normal. (OTV 149, 150).

Frost was visible around -Y and +Y ET GOX vent louver. (OTV 160, 161).

Two pieces of aft skirt instafoam ejected out of the SRB plume during ascent, at approximately 73 and 79 seconds after T-0 (TV 4B).

Throat plug material was ejected from the LH SRB exhaust hole; no vehicle contact noted. (OTV 163).

White debris, possibly paper, entered field of view after vehicle cleared the tower. (OTV 161).

OMS assist burn was visible following SRB separation. (TV 13).

ET aft dome charring was visible. (TV 2, TV 13)

Several ice particles originating from the forward LO2 feedline bellows were observed between ET and Orbiter. One particle contacted Orbiter lower surface tiles; no tile damage was noted. (OTV 161).

Notes

A total of 19 videos were made available for review.

Review of long range tracking films is scheduled to begin Tuesday, April 9, 2002.

Armando Oliu
NASA-KSC

Robert Speece
NASA-KSC

Abdi Khodadoust
Boeing - Huntington Beach

OMI-56447-STEP 150-1


**STS-110 ORBITER POST LANDING INSPECTION
DEBRIS ASSESSMENT
20 April 2002**


After the 12:26 pm local/eastern time landing on 19 April 2002, a post landing inspection of OV-104 Atlantis was conducted at the Kennedy Space Center on SLF runway 33 and in Orbiter Processing Facility bay 2. This inspection was performed to identify debris impact damage and, if possible, debris sources.

The Orbiter TPS sustained a total of 110 hits of which 22 had a major dimension of 1-inch or larger. This total does not include the numerous hits on the base heat shields attributed to SSME vibration/acoustics and exhaust plume recirculation.

The following table lists the STS-110 Orbiter damage hits by area:

	<u>HITS > 1-inch</u>	<u>TOTAL HITS</u>
Lower Surface	18	70
Upper Surface	0	0
Window Area	4	34
Right Side	0	6
Left Side	0	0
Right OMS Pod	0	0
Left OMS Pod	0	0
TOTALS	22	110


The Orbiter lower surface sustained 70 total hits, of which 18 had a major dimension of 1-inch or larger, both numbers are well within family. The area from the nose landing gear to the main landing gear wheel wells sustained 30 hits with 11 greater than 1-inch. Approximately 15 of the total lower surface hits were around the LH2 umbilical area. Most of these damage sites around the ET/ORB umbilical were most likely caused by pieces of the umbilical purge barrier flailing in the airstream and contacting tiles before pulling loose and falling aft. 

The largest lower surface tile damage site, located just forward of the RH main landing gear wheel well, measured 3-1/2 inches long by 3/4-inches wide by 5/8-inches deep. The cause of this damage has not been determined yet. 

Gap filler material was found protruding from in between tiles on the LH OMS pod eyeball area.

The landing gear tires were in good condition.

ET/Orbiter separation devices EO-1, EO-2, and EO-3 functioned normally. No ordnance fragments were found on the runway beneath the umbilicals. The EO-2 and EO-3 fitting retainer springs appeared to be in nominal configuration. The EO-2/3 pyro debris shutters were fully closed. No other debris was found beneath the umbilicals.

MAY 22 1992


Typical amount of tile damage occurred on the base heat shield. All SSME Dome Heat Shield closeout blankets were in good condition.

There were a total of 34 hits, with 4 having one dimension greater than 1-inch, on the window perimeter tiles. Hazing and streaking of forward-facing Orbiter windows appears to be heavier greater than normal. There is a window ding, 1/4-inch diameter, approximately at the center of window #2.

The post-landing walkdown of Runway 33 was performed immediately after landing. All components of the drag chute were recovered and appeared to have functioned normally.

In summary, the total number of Orbiter TPS debris hits and the number of hits 1-inch or larger were within established family. The potential identification of debris damage sources for mission STS-110 will be based on the laboratory analysis of Orbiter post landing microchemical samples, inspection of the recovered SRB components, film analysis, and aerodynamic debris particle trajectory analysis. The results of these analyses will be documented in the STS-110 Debris/Ice/TPS Assessment and Integrated Photographic Analysis report.

Armando Oliu
NASA - KSC

Robert Speece
NASA - KSC

OMI-56444-Step 150-1

STS-110 LANDING and ON-ORBIT FILM SUMMARY
KSC Photo/Video Analysis Team
29 April 2002

The last film/video data, 16mm and 35mm landing films, 35mm still images from the LO2 ET/ORB umbilical camera, 16mm motion picture with 5mm and 10mm lens from the LH2 ET/ORB umbilical cameras, and Crew Hand-Held Still Images of the External Tank after separation from the Orbiter were received and reviewed at KSC on 27 April 2002.

SIGNIFICANT ANOMALIES

None.

MINOR ANOMALIES

None.

FUNNIES

None.

Observations:

All landing events appeared nominal.

SRB separation from the External Tank appeared nominal.

ET separation from the Orbiter was normal.

No damage was detected on the LO2 ET/ORB umbilical disconnect, sealing surfaces, or closeout TPS. Typical ablation and divoting was noted on the vertical portion of the umbilical cable tray.

Two divots, approximately 5 inches by 5 inches, were observed on the intertank-to-LH2 tank flange closeouts between the bipods. One of the divots encompasses a significant portion of the +Y Jack Pad closeout.

No anomalies were detected in the LO2 tank acreage. The BSM burn scars were typical. The Ogive and the nose cone appeared be in excellent condition

The ablation/erosion of LO2 feedline flange closeouts was typical. Plug pull repairs on the feedline looked good.

MAY 21 1992

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*****
*      PROGRAM PRA120 SELECTION CRITERIA      *
*-----*
*      RPT TYPE: IPR                          *
*      PR GROUP:                               *
*      WORK AREA CD:                          *
*      PR ELEM CD:                            *
*      STS NO:                                *
*      Starting RPT DT: 03/04/02              *
*      Ending RPT DT: 05/22/02               *
*      LRU or Non-LRU: B                     *
*      PRACA EFF CD:                          *
*      EICN:                                  *
*      RPT STATUS: OP                         *
*      DETECTED DURING: S6444                *
*-----*
*      Sorted by DETECTED DURING, PR ELEM CD, and EICN *
*****

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* NO DATA FOUND ON THE DATABASE FOR THE SELECTED PARAMETERS *
*

*
* END OF REPORT *
*



2985694

TOP/WAD Deviation

TOP/WAD No. S 6444 (RUN 2)		REV/CHG/VER J03	<input checked="" type="checkbox"/> In Family <input type="checkbox"/> Out of Family <input type="checkbox"/> NMA	Cause Code Org (B,D,E,G,H,L,N,O,P,Q,S,T,V) E	Cause Code Reason 10-Tech Chg 20-Proc Chg 30-Auth Error 40-Rewrite 20
First Use <input type="checkbox"/> SRB BI- <input checked="" type="checkbox"/> ET 112 <input type="checkbox"/> GSE <input type="checkbox"/> STS-					
Effectivity: <input type="checkbox"/> ORB /FLT <input type="checkbox"/> FRCS/POD /FLT <input type="checkbox"/> SSME /FLT					
Affected: <input type="checkbox"/> OMRS/ACOMC/OMP <input type="checkbox"/> Design Req'ts <input type="checkbox"/> Haz Step(s) <input type="checkbox"/> PPE <input type="checkbox"/> Internal Review Req.					
Contractor OPR <i>R. Brewer 04/04/02</i>	Contractor Test Conductor		Gov't OPR		
Contractor Test Project Engineer <i>M. R. Z. 4/8/02</i>	Other <i>SE Check</i> <i>WIPART 4-8-02</i>		Gov't Project Engineer		
Contractor Safety	Other		Gov't Test Director or Contractor Chief TC		
<p>Page Number: 60-6 Step Number: 60-11 Add the following new substep:</p> <p>60-11.1 At terminal count, position camera no. 110 as shown in figure no. 1. This area is the LH2 Ventline retract haunch.</p> <p>ETM <u>ET/05</u> Date <u>4/08/02</u></p>					
<p>Originator (print) R. Brewer SPDMS ID ZQ6345 Phone 1-4429 Organization ETM-SE Date 04/05/2002 <input type="checkbox"/> Perm <input checked="" type="checkbox"/> Temp <input type="checkbox"/> Temp-Recycle</p> <p>MAY 22 '02</p>					

OMI-56444

Dev No. 60/01

PAGE 1 of 1

RUN NO. 2

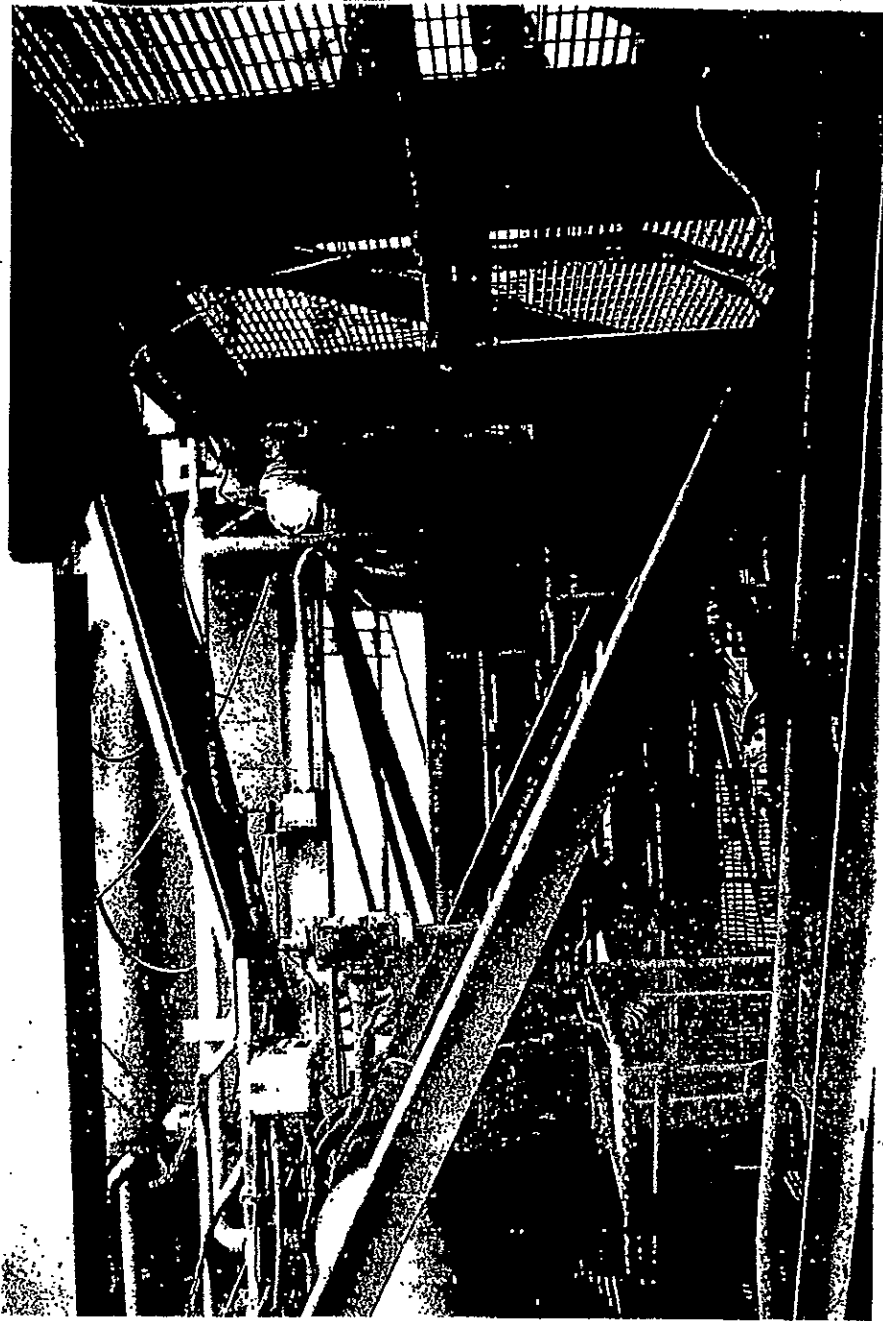


FIGURE NO. 1, VENTLINE RETRACT HAUNE

ETM: R Brewer 4/4/02

SE Check: DA RNT 4/5/02



56444

George C. Alford
Vice President and
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April 7, 2002
E600-CY02-125

George C. Marshall Space Flight Center
National Aeronautics & Space Administration
Marshall Space Flight Center, AL 35812


Attention Mr. M. U. Rudolphi, MP51

Gentlemen:

Subject: RSRM-85 (STS-110) Transmittal of L-24 Hour PMBT Prediction

This letter officially transmits the L-24 hour propellant mean bulk temperature (PMBT) predicted for STS-110, scheduled for launch on April 8, 2002. The PMBT at the time of launch is predicted to be 71°F, which is within the 44° to 86°F requirement. This PMBT prediction is also valid for April 9, 2002.

Very truly yours,


G. C. Alford

GCA:JBB

cc: G. Alford, E00
T. Boardman, L00
J. Burn, LD0
S. Eden, E68
J. Endicott, E68
K. Foulger/ E62
S. Henderson, LG1
D. Ruddel, E68
R. Roth, Thiokol/MSFC
T. Shaffner, Thiokol/KSC
M. Kahn, A10
B. St Aubin, Thiokol/KSC

D. Woods, MP51
D. Burton, K68
S. Cash, MP51
P. Teehan, KSC-SK